# MONTHLY WEATHER REVIEW.

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## INTRODUCTION.

The general weather conditions which prevailed over the United States and Canada during July, 1883, are presented in this REVIEW, based upon reports received from the regular stations of the Signal Service, from the Canadian Meteorological Service, and from co-operating state weather services and voluntary observers.

The following may be mentioned as the most noteworthy meteorological features of the month:

The large deficiencies in the monthly rainfall in the southern states and in the northern districts west of the 92d meridian resulted in drought in many localities, the most serious occurring in the eastern Gulf states. A comparison of the average precipitation for the several districts in the cotton region with that of July, 1882, shows deficiencies ranging from 0.69 inch in the district of Little Rock to 6.82 inches in the district of Vicksburg.

The mean temperature has been below the average in all parts of the United States, except on the Pacific coast and in the south Atlantic and east Gulf states, but the departures have not been unusually marked.

The severest local storms of the month occurred on the 12th and 13th, from Indiana westward to the eastern portions of Nebraska and Kansas, and on the 21st in Minnesota, Wisconsin, and Michigan.

Violent electrical storms were of great frequency, and numerous instances of serious damage by lightning have been reported.

The ice-chart, compared with that of June, shows that there has been a marked change in the extent of the ice region, the eastern limit having moved about two degrees to the westward, and, compared with the ice-chart of July, 1882, shows a great change in the positions of the limits of the ice region, and also a very marked diminution in the number of icebergs observed.

In the preparation of this REVIEW, the following data, received up to August 20th, have been used; viz.: the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and twenty-two Signal-Service stations and thirteen Canadian stations, as telegraphed to this office; one hundred and fifty-four monthly journals, and one hundred and thirty-eight monthly means from the former, and thirteen monthly means from the latter; two hundred and eighteen monthly registers from voluntary observers; fifty monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports, through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs, furnished by the publishers of "The New York Maritime Register;" monthly weather reports from the local weather services of Illinois, Indiana, Iowa, New Jersey, and Tennessee, and of the Central Pacific railway company; trustworthy newspaper extracts; and special reports.

## ATMOSPHERIC PRESSURE.

[*Expressed in inches and hundredths.*]

The distribution of mean atmospheric pressure for the month of July, 1883, determined from the tri-daily telegraphic observations of the Signal Service, is shown by the isobarometric lines on chart iii.

The regions of greatest mean pressure occupy about the same positions as in the preceding month, viz: the north Pacific coast, and the south Atlantic and Gulf states, but over the north Pacific coast region the pressure has decreased about .05, while a corresponding increase has taken place over the south Atlantic and Gulf states. The highest barometric mean for the month, 30.11, is reported from Cedar Keys, Florida. The isobar of 30.05 extends from eastern Texas, northward to southern Illinois, and thence eastward to the North Carolina coast, inclosing the short isobar of 30.1, which is traced near the northern boundary of Florida. Southward from Cedar Keys, the pressure decreases to 30.09 at Key West. On the north Pacific coast the isobar of 30.0 extends from the coast of southern Oregon northeastward to the northern boundary of Washington territory. The area of least mean pressure covers Utah, Colorado, Arizona, and a part of New Mexico, and is inclosed by the isobar of 29.85. The lowest barometric means, 29.79 and 29.80, are reported from Yuma, Arizona, and West Las Animas, Colorado.

The mean pressure of July, compared with that of June, shows decreases varying from .01 to .05 in the middle and north Pacific coast regions, and from .01 to .09 over the Canadian Maritime provinces, New England, and the northern portion of the middle Atlantic states. In all other parts of the country the mean pressure is greater than that of the preceding month. Over the Rocky mountain districts, the extreme northwest, Missouri valley, the eastern part of the lower lake region, and on the Atlantic coast south of New Jersey, the increase varies from .01 to .05. Over the remainder of the country, where an increase has taken place, the departures vary from .05 to .12, being greatest in the Rio Grande valley.

### DEPARTURES FROM THE NORMAL VALUES FOR THE MONTH.

Over the Rocky mountain regions, Ohio valley, middle Atlantic and southern states, the mean pressure is above the normal for July. The departures in these districts are generally less than .05, the only exceptions being .06 at Galveston, Texas; .07 at Fort Shaw, Montana, and .08 at Brownsville, Texas. The pressure is below the normal in southern California, the north Pacific coast region, over the northern districts from New England westward to Dakota, in the Missouri valley, eastern Colorado, and northern Texas. The only departures exceeding .05 in the districts where the deficiencies occur, are .06 at Port Huron, Michigan, and .08 at Duluth, Minnesota.

### BAROMETRIC RANGES.

The monthly barometric ranges have been greatest in the extreme northwest and in the northern part of the upper lake region, where they have varied from .73 to .85. They are least in the southern states, Rocky mountain districts, and in California. The stations reporting the smallest ranges are Key West, Florida, .18; and Fort Apache, Arizona, 25.

The monthly ranges have varied in the different districts as follows:

*New England.*—From 0.46 on the summit of Mount Washington, New Hampshire, to 0.62 at Eastport, Maine.

*Middle Atlantic states.*—From 0.50 at Lynchburg, Virginia, to 0.58 at Cape Henry, Virginia.

*South Atlantic states.*—From 0.38 at Charleston, South Carolina, to 0.56 at Hatteras and Kittyhawk, North Carolina.

*Florida.*—From 0.18 at Key West, to 0.32 at Sanford.

*Eastern Gulf.*—From 0.28 at New Orleans, Louisiana, to 0.40 at Montgomery, Alabama.

*Western Gulf.*—From 0.32 at Galveston, Texas, to 0.52 at Fort Smith, Arkansas.

*Ohio valley and Tennessee.*—From 0.50 at Chattanooga, Tennessee, to 0.62 at Indianapolis, Indiana.

*Lower lakes.*—From 0.54 at Erie, Pennsylvania, to 0.59 at Detroit, Michigan.

*Upper lakes.*—From 0.64 at Chicago, Illinois, to 0.74 at Duluth, Minnesota, and at Mackinaw City and Marquette, Michigan.

*Extreme northwest.*—From 0.75 at Moorhead, Minnesota, to 0.85 at Bismarck, Dakota.

*Upper Mississippi valley.*—From 0.62 at Cairo, Illinois, to 0.71 at La Crosse, Wisconsin, and Saint Paul, Minnesota.

*Missouri valley.*—From 0.60 at Omaha, Nebraska, to 0.74 at Huron, Dakota.

*Northern slope.*—From 0.38 at Helena, Montana, to 0.64 at North Platte, Nebraska.

*Middle slope.*—From 0.42 at Denver, Colorado, to 0.50 at West Las Animas, Colorado.

*Southern slope.*—From 0.40 at Fort Stockton, Texas, to 0.41 at Fort Concoo, Texas.

*Southern plateau.*—From 0.25 at Fort Apache, Arizona, to 0.40 at El Paso, Texas.

*Northern plateau.*—From 0.37 at Spokane Falls, Washington Territory, to 0.43 at Lewiston, Idaho.

*North Pacific coast.*—From 0.48 at Roseburg, Oregon, to 0.50 at Portland, Oregon.

*Middle Pacific coast.*—From 0.40 at San Francisco, California, to 0.51 at Red Bluff, California.

*South Pacific coast.*—From 0.27 at Los Angeles, California, to 0.34 at Yuma, Arizona.

### AREAS OF HIGH BAROMETER.

Four areas of high barometer have been traced over the districts east of the Rocky mountains during the month. The general course of the movement of these areas was to the southeast, inclining more to the south than usual, and in each case passing over the Atlantic from the west and south of the lake region, while in the month immediately preceding, the four areas traced passed to the Atlantic north of the Ohio valley. In addition to the areas of high barometer traced within the limits of the stations of observation, several waves of high pressure appeared on the north Pacific coast during the month, but in no case has it been possible to trace these waves of pressure eastward of the Rocky mountains as defined high areas, while the daily charts of barometric change show the gradual advance of these pressure waves from the Pacific to the Atlantic coast.

I.—This area of high pressure appeared north of the upper lake region on the 30th of last month, and moved southward to the Ohio valley, where it was central on the morning of the 1st of July. During the 2d and 3d it moved southeastward off the south Atlantic coast, and apparently extended along the coast from Florida to Nova Scotia, where the pressure was 30.20 on the morning of the 4th. The increase of pressure at the northeastern stations indicates that this area moved east or northeast after leaving the coast-line. The continued south and southwest winds which followed the transit of this area over the southern, middle, and New England states, caused the temperature to rise to the maximum of the month at many stations.

II.—This area was observed in British America west of Hudson's bay on the morning of the 7th, when the storm, traced as number iii., was central near Lake Ontario. On the morning of the 8th it was central near Lake Superior, the temperature having fallen from 10° to 20° in the lower lake region during the past twenty-four hours, and cool northerly winds and clear weather prevailed in the upper lake region and the upper Mississippi valley. After passing Lake Superior on the 8th, the course of this area was almost southerly, inclining first to the southwest, and then following the Mississippi valley, the greatest pressure being reported at Cairo, Illinois, on the morning of the 10th. The pressure increased slowly at the Atlantic coast stations, with a slight fall of temperature, while this area of high pressure moved southward over the central valley. It was last observed near the southern part of Florida, on the morning of the 11th.

III.—This area was first observed as an extended wave of high pressure on the morning of the 17th, probably central in the Missouri valley and following the well defined low area, traced as number vii. The barometer was relatively high at the stations near the boundary from Manitoba to Oregon, and the reports indicate that this cool wave first appeared on the north Pacific coast as the pressure was above the normal in that region on the 15th and 16th. This area moved slowly to the eastward during the 18th and 19th, passing over Missouri and the Ohio valley, attended by cool and generally clear weather in all districts. The morning report of the 20th indicated a pressure of 30.20 and above in the southern portions of the middle Atlantic states, which at this time was included in this area. It passed to the east of the coast stations, extending from north to south from New England to Florida, on the 21st, when the greatest pressure was to the east of the North Carolina coast. The tri-daily charts of 22d, 23d, 24th, and 25th, show that this area of high pressure apparently moved to the southwest, after passing to the east of the Atlantic coast stations, the centre of greatest pressure being located in Georgia on the 23d, and south of Mississippi and Louisiana on the 24th and 25th. The pressure continued high in the southern portions of the United States during the 26th and 27th, and this area did not disappear wholly from that region until the 28th.

High area number iv., appeared in British America, north of Dakota, on the 28th, the pressure having been above the normal on the north Pacific coast on the 24th, 25th, and 26th. This area extended southward over the Mississippi valley as far as the Gulf coast, the greatest pressure being in Iowa on the morning of that day, and also on the morning of the 30th, although it was one-tenth of an inch less on the last named day. It moved southeastward from Iowa to Florida during the 30th and 31st, causing a slight fall in temperature, and attended by light showers at stations to the south and east of the greatest pressure.

The waves of high pressure observed on the Pacific coast did not pass to the south of central California, and in most cases were only indicated by the pressures reported at the most northerly stations. These waves were observed on the following dates: from the 11th to the morning of the 14th; from midnight of the 14th to the 16th; from the 18th to the 19th; from the 22d to the 26th; and from the 29th to the 31st.

### AREAS OF LOW BAROMETER.

Eight areas of low barometer have been traced from the tri-daily telegraphic reports. The tracks of the centres of these areas are shown on chart number i. In no case has an area of low barometer appeared in the southern states, and only one passed to the eastward south of New England. Four of these storms apparently developed in the Rocky mountain regions, and three passed so far to the north of the lake region from northwestern British America as to make the location of the centre of disturbance only approximate. No depression has been traced from the Pacific coast eastward.

The following table shows the latitudes and longitudes in

which each depression was first and last observed, and the hourly velocity of each depression:

| Areas of low barometer. | First observed. | | Last observed. | | Average velocity in miles per hour. |
|---|---|---|---|---|---|
| | Lat. N. | Long. W. | Lat. N. | Long. W. | |
| | ° ′ | ° ′ | ° ′ | ° ′ | |
| No. I. | 51 00 | 97 00 | 52 00 | 63 00 | 39.0 |
| II. | 38 00 | 107 00 | 51 00 | 62 00 | 41.0 |
| III. | 37 00 | 108 00 | 45 00 | 61 00 | 30.5 |
| IV. | 53 00 | 96 00 | 51 00 | 81 00 | 42.0 |
| V. | 53 00 | 99 00 | 50 00 | 69 00 | 24.0 |
| VI. | 53 00 | 102 00 | 50 00 | 92 00 | 28.0 |
| VII. | 46 00 | 106 00 | 51 00 | 66 00 | 28.0 |
| VIII. | 37 00 | 104 00 | 37 00 | 73 00 | 18.5 |
| Mean hourly velocity | | | | | 31.4 |

I.—This disturbance developed in British America during the latter part of June, and was central in Manitoba on the morning of the 1st of July. It moved slightly to the southward during the 1st, approaching Lake Superior, where brisk southerly winds occurred, while the centre of disturbance was north of the upper lake region. The easterly movement of this depression was slightly retarded as it passed near the lake region on the 1st, but it passed rapidly down the Saint Lawrence valley on the 2d, increasing in energy and causing severe gales at stations near the centre of disturbance. When first observed in the northwest the barometer at the centre read 29.66, and when last observed in the northeast the barometer at the centre had fallen to 29.31. The rain area attending this disturbance extended over the lake region, New England, and New York, but the rainfalls were light and of short duration.

II.—This disturbance was developing slowly in the Rocky mountain region when the preceding low area was passing off the coast of New Brunswick. It was apparently central in Colorado on the afternoon of the 2d, but passed northeastward to southern Dakota during the night, afterwards returning to eastern Colorado before moving eastward over the lake region. The 11 p. m. tri-daily chart of the 3d shows a trough of low pressure extending from northeast to southwest, over the upper lake region and northwest, with apparently two centres of disturbance—one near Saint Paul, Minnesota, which is given on the storm-track, and a second near Cheyenne, Wyoming. The last named disturbance apparently moved to the southwest, and formed a part of an extended low area which was afterwards traced as number iii. The principal disturbance moved rapidly northeastward after passing the Mississippi valley, and disappeared to the east of the Gulf of Saint Lawrence on the 5th. This disturbance did not extend south of the Ohio valley and the pressure did not fall below 29.70 at stations near its centre.

III.—This storm developed in western Colorado on the 4th, and remained almost stationary in that region until the morning of the 6th, when the centre was located near West Las Animas, the barometer indicating a pressure of 29.67 at that station at 11 p. m. of the 5th, and 29.77 at the 7 a. m. report of the 6th, with a general increase of pressure and northerly winds in Colorado, thus indicating an easterly movement of the disturbance. On the afternoon of the 6th there was a well-marked low area in the upper Mississippi valley, and local rains were reported in the central valley and lake region. Strong north and west winds prevailed at stations in the Missouri valley, Kansas, and Nebraska, and violent local storms occurred in Minnesota. At midnight of the 3d this storm was central in eastern Wisconsin, the isobar of 29.70 inclosing the centre and extending east and west south of Lake Superior. Very heavy rains and destructive storms occurred in Michigan and Wisconsin during the night of the 6th. The morning reports of the 7th showed a contraction of the central area in a north and south direction, probably due to the advance of a volume of cool air from the north, previously referred to as high area number ii. This disturbance passed from north of Lake Ontario to east Nova Scotia during the 7th, but rain continued in the northern districts until the 8th, and on the middle Atlantic and New England coasts until the 9th. A secondary depression developed on the middle Atlantic coast after the principal area had passed over the Atlantic, causing heavy rains and violent local winds at stations between Cape Hatteras, North Carolina, and Sandy Hook, New Jersey.

IV.—This depression was at no time within the limits of the territory of the United States. On the afternoon of the 9th a slight depression appeared north of Manitoba, and the succeeding report indicated that this disturbance passed directly eastward north of the lake region. The location of the centre of this area is approximately given for the 11 p. m. report of the 9th, and the 7 a. m. report of the 10th. Local rains occurred in the lake region and Saint Lawrence valley on the 10th.

V.—This was a well-marked disturbance which appeared north of Minnesota on the morning of the 11th. It moved southeastward during the 11th, the pressure near the centre being near 29.50, and at midnight the centre was near Duluth, Minnesota, with cool northerly winds at Saint Vincent, Minnesota, and Fort Garry, Manitoba. After reaching the lake region the course changed to easterly, and the storm continued in this direction until the afternoon report of the 12th, when its course changed to the northeast, near Saugeen, Ontario. This was a general disturbance, causing rain in all districts north of the Gulf states. When this disturbance passed over the Saint Lawrence valley, it was apparently retarded, losing much of its energy, while becoming much extended.

VI.—Appeared in British America, on the 13th, and passed southeastward towards Lake Superior, but was last observed as central north of Duluth on the afternoon of the 14th. Although there were indications of a slight depression in the lake region following that report, no well-marked area could be located.

VII.—On the morning of the 15th a well-defined low area was central in the Yellowstone valley, near Fort Keogh, Montana, inclosed by an elliptical isobar of 29.70. This depression moved first southward to eastern Colorado, and after the afternoon report of the 15th it moved to the northeast or east. On the morning of the 16th the storm was central immediately west of Duluth, and at the 3 p. m report of the same day it was central near and northeast of that station, the barometer falling to 29.50, and wind sw., 24 miles. The centre passed directly east during the succeeding reports, attended by severe local storms in the northern portions of the lake region, during the night of the 17th. After reaching the Saint Lawrence valley the course changed to the northeast, and this movement continued until the storm passed beyond the stations of observation, on the 18th.

VIII.—The atmospheric pressure was below the normal at the stations west of the Mississippi valley during the 20th and 21st, and slight depressions formed north of Dakota and on the eastern slope of the Rocky Mountains. The depression traced as number viii. was central in southeastern Colorado at 3 p. m. of the 20th, and it remained in that region until the 23d, moving first to northern Texas, then to southern Dakota, thence back to eastern Colorado and western Nebraska, after which it passed eastward over southern Dakota and southern Minnesota, the course then changing to southeast after passing the Mississippi valley, and crossed the eastern portion of the United States during the 23d and 24th, leaving the Virginia coast as a well marked disturbance. This was the only disturbance occurring during the month which passed south of the lake region. It was well defined, but the depression at the centre was not greater than 29.70.

## NORTH ATLANTIC STORMS DURING JULY, 1883.

[*Pressure expressed in inches and in millimetres; wind-force by scale of* 0—10.]

Chart ii. exhibits the tracks of the principal depressions that have moved over the north Atlantic ocean during July, 1883.

The location of the various storm-centres has been approximately determined from reports of observations furnished by agents and captains of ocean steamships and sailing vessels in

the north Atlantic, and from other miscellaneous data received at this office up to August 21st. The observations used are, in general, simultaneous, being taken each day at 7 h. 0 m. a. m. Washington, or 0 h. 8. m. p. m. Greenwich mean time.

For the month of July, 1883, the paths of seven areas of barometric minima have been traced. Three of these first appeared near W. 15° and passed northeastward over the British Isles; two were probably continuations of storms that first developed in the United States, while the remaining two appear to have originated near the coast. None of the depressions charted have displayed any special storm-energy, with the exception of low-area iii., which moved northeastward with unusual rapidity as a somewhat severe storm, the barometer near the centre of disturbance falling to 29.00 (736.6.)

The weather over the Atlantic during the month may be summarized as follows: 1st to 9th, moderate to strong breezes, generally from west and southwest, weather overcast; 9th to 12th, moderate to strong gales between 20° and 40° west longitude, weather cloudy and rainy; 12th to 21st, light to moderate breezes, variable in direction, and generally cloudy weather with occasional fog and rain; 21st to the close of the month, moderate to strong southerly, westerly and northwesterly breezes, increasing occasionally to moderate gales, weather generally overcast, with frequent rains.

The following descriptions refer to the depressions shown on the chart:

I.—This disturbance was apparently central near N. 55°, W. 17° on the 1st; on that date the s. s. "State of Indiana," in N. 55° 12′, W. 14° 30′, reported barometer 29.2 (741.7), wind ese., force 7, raining. The s. s. "Sardinian," in N. 55° 10′, W. 16° 10′, reported barometer 29.27 (743.4), wind ese., force 6; while the ship "Cornelius," in N. 51° 43′, W. 20° 30′, had wnw. wind of force 8, barometer 29.42 (747.3), heavy rain. During the day the disturbance moved slowly northeastward, and on the 2d it was central off the northwest coast of Ireland, causing strong southerly winds and rain over that country.

II.—From the 5th to the 8th an area of low pressures remained off the Irish coast, causing strong southerly and southwesterly winds in Ireland and over the English Channel. The region of low barometer occupied the ocean from W. 20° eastward to the Irish coast, the pressures ranging from 29.35 (745.5) to 29.75 (755.6). On the 9th an increase of pressure set in over the region east of the fifteenth meridian, but to the westward of that meridian the pressure decreased, under the influence of low-area iii., then advancing rapidly northeastward.

III.—This was probably a continuation of the storm traced as low-area iii., on chart i. At midnight of the 7th the disturbance was central east of Nova Scotia, and by the morning of the 8th it was south of Newfoundland, attended by moderate southwesterly breezes. During the day the disturbance moved rapidly northeastward with decreasing pressure and with greatly increased storm-energy; on the 9th the storm-centre was probably near N. 51°, W. 34°; the s. s. "City of Chester," in N. 50° 31′, W. 32° 38′, reported: 9.58 a. m., barometer 28.85 (732.8) (instrumental error not known), wind sw., force 6, overcast, with rain, barometer falling rapidly. From 6 p. m. until midnight of the 9th, the wind blew with hurricane force from wnw. Other vessels near the same region as the "City of Chester," reported as follows: s. s. "Arizona," in N. 49° 23′, W. 30° 54′, barometer 29.17 (740.9), wind s., force 7, raining, high sw. sea; s. s. "Lord Clive," at 10.13 a. m., in N. 49° 15′, W. 28° 50′, barometer 29.12 (739.6), wind s., force 6, heavy rain; at noon, N. 49° 10′, W. 29° 9′, the barometer read 29.12 (739.6), falling slowly; at 2 p. m. 29.08 (738.6); at 2.30 p. m. the wind suddenly shifted to sw. and w., the barometer rising; at 4 p. m. wind increasing to force 7; from 8 p. m. until 8 a. m. of the 10th, strong w. gale with heavy squalls and high sea. On the 10th the disturbance was central near N. 54° W. 23°, attended by strong northerly and northwesterly gales to the westward of the twenty-fifth meridian, and moderate to strong southwesterly gales south of N. 52°, with moderate southeasterly and easterly breezes to the northward. On the 11th the storm-centre having moved east-northeastward with but slight changes in pressure, was central off the northwestern coast of Ireland, the region of low pressures being inclosed by the isobar for 29.25 (742.9). Strong southwesterly winds prevailed over the British Isles and the English Channel. By the morning of the 12th the disturbance had moved over Scotland, and was central over the northern part of the North sea.

IV.—This disturbance appears to have developed off the New England coast on the 16th, the lowest pressure reported being 29.74 (755.4). It moved eastward with increasing pressure and disappeared on the 17th, without exhibiting any storm-energy.

V.—On the 18th there was a decrease of pressure over the ocean near W. 20°. During the 19th and 20th the decrease spread eastward, and on the last-mentioned date the disturbance was probably central over or near the British Isles.

VI.—This depression appeared over the Gulf of Saint Lawrence on the 23d; it moved slowly over the Gulf causing easterly gales and heavy rains, and by the 25th it was apparently central about N. 48°, W. 50°, near which region vessels reported pressures ranging from 29.4 (746.7) to 29.7 (754.4), with moderate southerly breezes. On the 26th the storm-centre was near N. 51°, W. 45°, the region of least pressure being indicated by the isobar for 29.5 (749.3), while the winds continued light or moderate. On the 27th the disturbance was in N. 54° W. 40°, the s. s. "Colina," in N. 53° 45′, W. 41° 18′, reporting barometer 29.45 (748.0), wind n. by e., force, 2. After the 27th the depression passed beyond the range of the observations.

VII.—This was probably a continuation of the disturbance traced as low area viii. on chart i. It passed off the coast into the Atlantic on the 24th, and on the 25th it was central near N. 37°, W. 71°, the brig "O. C. Clary," in N. 36° 32′, W. 71° 3′, reported barometer 29.4 (746.7), wind wsw., force 6, with violent squalls, rough sea and rainy weather. During the day the depression passed northeastward, attended by moderate gales, and probably united with low area vi. then central near the Banks.

## OCEAN ICE.

Chart ii. also exhibits the southern and eastern limits of icebergs in the north Atlantic during the month of July, 1883. This chart is based on reports communicated by shipmasters to this office, reports furnished through the co-operation of the "New York Herald Weather Service," and other data published in the "New York Maritime Register."

During July, 1883, the easternmost icebergs were observed in about N. 46°, W. 45°, the southern limit being about N. 42° 30′, W. 50°. North of the fifty-first parallel, near the Straits of Belle Isle, numerous icebergs were observed, but no field-ice was seen. Icebergs were also reported in the Gulf of Saint Lawrence. South of N. 46° only five small icebergs were observed during the month.

Compared with the chart for the preceding month (June, 1883), there has been a marked change in the extent of the ice region, the eastern limit having moved about two degrees to the westward, while the southern limit is about two degrees farther north than that of last month.

A comparison of this chart with the ice-chart for July, 1882, shows a great change in the positions of the limits of the ice region, and also a very marked diminution in the number of icebergs observed. In July of last year the eastern limit was near W. 40°, or about five and a half degrees farther to the eastward, while the southern limit was on the fortieth parallel, or about two and a half degrees farther south than in July of this year.

Icebergs were reported as follows:

3d.—S. S. "Main," in N. 43° 6′, W. 49° 17′, passed an iceberg; also, in N. 43° 1′, W. 50° 18′, passed another; bark "Saga," in N. 47° 56′, W. 46° 25′, passed an iceberg one hundred and forty-five feet high; also in N. 48° 10′, W. 45° 55′, passed two icebergs.

4th.—S. S. "Pavonia," in N. 42° 42′, W. 49° 57′, passed an iceberg.

5th.—S. S. "Barcelona," one hundred miles east of Anticosti, collided with an iceberg, crushing in the whole of her bows about two feet above the water line; s. s. "Manitoban," in N. 52° 36′, W. 53° 54′, passed an iceberg; also, passed a number of icebergs between N. 52° 57′, W. 51° 15′ and N. 53° 7′, W. 51° 20′.

6th.—S. S. "Wyoming," in N. 46° 47′, W. 45° 44′, passed an iceberg; also, in N. 46° 41′, W. 45° 54′, passed another.

7th.—S. S. "Colina," in N. 52° 20′, W. 51° 21′, passed several large icebergs.

16th.—S. S. "City of Paris," in N. 42° 45′, W. 50° 32′, passed an iceberg.

17th.—S. S. "General Werder," in N. 47° 43′, W. 48° 5′, passed a large iceberg.

19th.—S. S. "Lord Gough," in N. 48° 1′, W. 48° 49′, passed an iceberg; s. s. "Bohemia," N. 46° 41′, W. 48° 54′, passed an iceberg; s. s. "Grecian," between N. 52° 55′, W. 50° 00′ and N. 52° 00′, W. 54° 20′, passed fifteen large icebergs.

25th.—S. S. "Colina," from Quebec to Glasgow, sighted about forty icebergs during the passage, the easternmost one being in N. 52° 36′, W. 48° 5′.

25th and 26th.—S. S. "Lake Huron," from two hundred miles east-northeast of the Straits of Belle Isle, up to the Straits, passed about seventy icebergs, some very large.

29th.—S. S. "Sylvia," on the edge of the Banks, passed a large iceberg.

31st.—S. S. "Durham City," in N. 49° 45′, W. 48° 30′, passed seven large icebergs, one of which was about three hundred feet high and two miles long.

## TEMPERATURE OF THE AIR.

[*Expressed in degrees, Fahrenheit.*]

The distribution of mean temperature over the United States and Canada, for the month of July, 1883, is exhibited on chart iii., by the dotted isothermal lines.

In the first column of the following table are shown the normal temperatures of July in the several districts, as determined from the Signal-Service records; the second column shows the mean temperature of July, 1883, and the third column shows the departures of July, 1883, from the normal:

*Average Temperatures for July, 1883.*

| Districts. | Average for July. Signal-Service observations. | | Comparison of July, 1883, with the average for several years. |
|---|---|---|---|
| | For several years. | For 1883. | |
| | ° | ° | ° |
| New England | 69.8 | 69.0 | 0.8 below. |
| Middle Atlantic states | 75.6 | 75.3 | 0.3 below. |
| South Atlantic states | 80.4 | 81.5 | 1.1 above. |
| Florida peninsula | 83.0 | 84.2 | 1.2 above. |
| Eastern Gulf | 81.2 | 81.8 | 0.6 above. |
| Western Gulf | 82.7 | 82.1 | 0.6 below. |
| Tennessee | 79.4 | 78.1 | 1.3 below. |
| Ohio valley | 77.8 | 75.4 | 2.4 below. |
| Lower lakes | 70.9 | 68.4 | 2.5 below. |
| Upper lakes | 68.5 | 65.9 | 2.6 below. |
| Extreme northwest | 68.7 | 65.5 | 3.2 below. |
| Upper Mississippi valley | 76.1 | 74.1 | 2.0 below. |
| Missouri valley | 76.0 | 73.7 | 2.3 below. |
| Northern slope | 69.1 | 66.9 | 2.2 below. |
| Middle slope | 73.7 | 73.6 | 0.1 below. |
| Southern slope | 81.5 | 80.0 | 1.5 below. |
| Northern plateau | 70.2 | 72.6 | 2.4 above. |
| Southern plateau | 82.0 | 80.0 | 2.0 below. |
| North Pacific | 66.7 | 66.9 | 0.2 above. |
| Middle Pacific | 71.2 | 72.3 | 1.1 above. |
| South Pacific | 80.0 | 80.9 | 0.9 above. |
| Mount Washington, N. H | 48.0 | 46.4 | 1.6 below. |
| Pike's Peak, Colo | 40.4 | 39.1 | 1.3 below. |
| Salt Lake City, Utah | 76.4 | 75.9 | 0.5 below. |

The month of July, 1883, has been colder than the average in nearly all sections of the country. The Pacific coast, northern plateau, the south Atlantic and east Gulf states, are the only districts in which the mean temperature has been above the normal. In California it has averaged 1° above the mean; in the north Pacific coast region, 0.2; northern plateau, 2°.4; and in the south Atlantic and east Gulf states, about 1°. The region where the greatest departures below the normal temperature have occurred, embraces the territory extending from the lower lakes westward to the Rocky mountains, and from the Ohio and Missouri rivers northward to British America. The deficiencies in these districts vary from 2° in the upper Mississippi valley to 3°.2 in the extreme northwest. In New England, the middle Atlantic and west Gulf states, and middle slope, the mean temperature is less than 1° below the normal.

The general distribution of mean temperature, and the districts of maximum departures for the month of July, in each year since 1873, are as follows:

| Districts. | Maximum departures. | Year. | Remarks. |
|---|---|---|---|
| | ° | | |
| | | 1873... | Normal in the extreme northwest, lake region, and lower Mississippi valley; below the normal in the south Atlantic and west Gulf states, and upper Mississippi valley; above the normal in New England, the middle Atlantic states and lower Missouri valley. |
| Lower Missouri valley | + 4.6 | 1874... | Above the normal in the upper lake region, Minnesota, and in the Ohio, upper Mississippi and lower Missouri valleys; below the normal in the lower lake region, Saint Lawrence valley, and in the states bordering on the Atlantic and Gulf coasts, and also on the Pacific coast. |
| Ohio valley and Tennessee | + 2.1 | | |
| South Atlantic states | − 2.3 | | |
| Pacific coast | − 2.2 | | |
| Saint Lawrence valley | − 2.0 | | |
| South Atlantic states | + 2.7 | 1875... | Normal in Minnesota; above the normal in Tennessee and the Ohio valley, lower lake region, and in the Atlantic and Gulf states; below the normal in the upper lake region, and in the lower Missouri, upper Mississippi and Saint Lawrence valleys. |
| Gulf states | + 1.8 | | |
| Lower lakes | + 1.3 | | |
| Upper lakes | − 2.1 | | |
| Saint Lawrence valley | − 2.0 | | |
| Lower lakes | + 4.5 | 1876... | Above the normal in Minnesota, and in all districts east of the Mississippi river; slightly below the normal in the lower Missouri valley; normal in the upper Mississippi valley. |
| Middle Atlantic states | + 3.5 | | |
| New England | + 2.7 | | |
| Lower Missouri valley | − 0.2 | | |
| Pacific coast | + 1.3 | 1877... | Normal in the upper Missouri valley and in New England; slightly above the normal in Minnesota, the lake region, middle and south Atlantic and Gulf states, on the Pacific coast and at the Rocky mountain stations; slightly below the normal in the Ohio, upper Mississippi and lower Missouri valleys, and in Tennessee. |
| Minnesota | + 1.3 | | |
| South Atlantic states | + 1.2 | | |
| Gulf states | + 1.2 | | |
| Lower Missouri valley | − 1.2 | | |
| Upper Mississippi valley | − 0.4 | | |
| Upper lakes | + 4.4 | 1878... | Above the normal in all districts east of the Missouri and lower Mississippi rivers; slightly below the normal on the Pacific coast. |
| Lower lakes | + 3.7 | | |
| Ohio valley and Tennessee | + 2.6 | | |
| Minnesota | + 2.6 | | |
| Pacific coast | − 1.1 | | |
| Upper lakes | + 2.6 | 1879... | Below the normal west of the Rocky mountains, in the Saint Lawrence valley, New England and middle Atlantic states; normal in the east Gulf states; above the normal in all other districts. |
| Rio Grande valley | + 2.0 | | |
| Ohio valley and Tennessee | + 2.0 | | |
| North Pacific coast | − 2.2 | | |
| Middle Pacific coast | − 2.2 | | |
| Saint Lawrence valley | − 2.1 | | |
| Canadian Maritime stations | + 2.6 | 1880... | Normal in the middle Atlantic states; below the normal in all other parts of the country, except at the Canadian Maritime stations, in New England, Florida, and on the middle Pacific coast. |
| Florida | + 0.7 | | |
| Middle Pacific coast | + 0.7 | | |
| Northern plateau | − 3.2 | | |
| Ohio valley and Tennessee | − 2.2 | | |
| Eastern Gulf | − 2.1 | | |
| Pike's Peak | + 3.0 | 1881... | Below the normal in the districts west of the Rocky mountains; above the normal in all eastern districts, except normal in the middle Atlantic states, and northern slope. |
| Ohio valley | + 2.1 | | |
| Western Gulf | + 2.0 | | |
| Northern plateau | − 4.3 | | |
| North Pacific coast | − 3.3 | | |
| South Pacific coast | − 2.9 | | |
| Northern plateau | + 1.1 | 1882... | Below the normal in all parts of the country, except in New England, the northern plateau, and in California. The deficiencies are slight along the Atlantic coast, in Tennessee, the southern and middle plateau districts, and in the north Pacific coast region. |
| Middle Pacific coast | + 1.0 | | |
| Upper Mississippi valley | − 6.0 | | |
| Ohio valley | − 5.1 | | |
| Missouri valley | − 4.9 | | |

The following are some of the highest and lowest monthly mean temperatures reported from the Signal-Service stations:

| Stations reporting highest. | | Stations reporting lowest. | |
|---|---|---|---|
| | ° | | ° |
| Yuma, Arizona | 92.1 | Cape Mendocino, California | 52.0 |
| Phœnix, Arizona | 89.0 | San Francisco, California | 58.8 |
| Rio Grande City, Texas | 86.2 | Eastport, Maine | 60.2 |
| Key West, Florida | 84.8 | Saint Vincent, Minnesota | 62.0 |
| Savannah, Georgia | 84.4 | Marquette, Michigan | 62.0 |
| Jacksonville, Florida | 84.1 | Fort Shaw, Montana | 62.1 |
| Shreveport, Louisiana | 83.9 | Fort Maginnis, Montana | 62.5 |
| Key West, Florida | 83.8 | Mackinaw City, Michigan | 62.5 |
| Mobile, Alabama | 83.6 | Alpena, Michigan | 63.2 |
| New Orleans, Louisiana | 83.5 | Escanaba, Michigan | 63.8 |
| Sanford, Florida | 83.5 | Cheyenne, Wyoming | 64.1 |

## DEVIATIONS FROM MEAN TEMPERATURE.

The departures exhibited by the reports from the regular Signal-Service stations are shown in the table of average tem-

peratures for July, 1883. Voluntary observers report the following notes in connection with this subject:

*Illinois.*—Anna, Union county: mean temperature, 76°.2, is 2°.9 below the July average of the last eight years.

Riley, McHenry county: mean temperature, 69°.5, is 1°.2 below the July average of the last twenty-two years.

*Indiana.*—Vevay, Switzerland county: mean temperature, 77°.3, is 1°.4 below the July mean of the last eight years.

Wabash, Wabash county: mean temperature, 72°.4, is 1°.9 below the July average of the last seven years.

*Kansas.*—Manhattan, Riley county: mean temperature, 73°.7, is 5°.4 below the July average of twenty-four years.

Lawrence, Douglass county: mean temperature, 76°.2, is 2°.2 below the July average of sixteen years.

Wellington, Sumner county: mean temperature, 74°.5, is 3°.4 below the July average of the four preceding years.

*Maine.*—Gardiner, Kennebec county: mean temperature, 66°.9, is 1°.9 below the July average of the last forty-seven years. The highest July mean of that period, 74°.2, occurred in 1854; the lowest, 65°.4, occurred in 1844.

*New York.*—Palermo, Oswego county: mean temperature, 64°.8, is 4°.8 below the July normal of the last thirty years. The highest July mean of that period, 79°.1, occurred in 1868; the lowest, 62°.0, occurred in 1860.

North Volney, Oswego county: mean temperature, 67°.2, is 2°.7 below the July normal of a period of sixteen years.

*Ohio.*—Wauseon, Fulton County: mean temperature, 70°.0, is 2.°8 below the July average of the last thirteen years. The highest July mean of that period, 75°.3, occurred in 1878; the lowest, 67°.7, occurred in 1882.

*Pennsylvania.*—Dyberry, Wayne county: mean temperature, 66°.9, is 1°.5 below the July mean of the last sixteen years. The highest July mean of that period, 71°.7, occurred in 1887; the lowest, 63°.9, occurred in 1865.

*Table of Comparative Maximum Temperatures for the Month of July.*

| State or Territory. | Maximum for July, 1883, Signal Service. | | Maximum since Signal-Service stations were opened—3 to 12 years. | | | Highest from any other source. | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Station. | Temp. | Station. | Temp | Year. | Place. | Temp. | Year. | Length of Record. |
| | | ° | | ° | | | ° | | |
| Alabama | Mobile | 100 | Montgomery | 107 | 1881 | Mount Vernon Arsenal | 100 | | 33 years. |
| Do | Montgomery | 99 | Mobile | 101 | 1881 | Opelika | 102 | 1882 | 1 " |
| Arizona | Phœnix | 112 | Yuma | 118 | 1878 | Fort Mojave | 118 | '70, '73 | 22 " |
| Do | Yuma | 111 | Stanwix | 116 | 1877 | Texas Hill | 118 | 1882 | — " |
| Arkansas | Fort Smith | 100 | Little Rock | 100 | '79, '81 | Washington, (near) | 108 | 1860 | 28 " |
| California | Red Bluff | 107 | Red Bluff | 110 | 1879 | Fort Yuma | 119 | 1877 | 32 " |
| Do | Sacramento | 104 | Visalia | 107 | 1879 | Fort Miller | 118 | 1853? | 13 " |
| Colorado | West Las Animas | 100 | Denver | 102 | 1874 | Fort Lyon | 108 | '68'69'78 | 23 " |
| Connecticut | New Haven | 91 | New Haven | 95 | 1870 | New Haven | 101 | 1864? | 88 " |
| Dakota | Yankton | 103 | Fort Sully | 109 | 1877 | Fort Sully | 114 | 1871 | 17 " |
| Delaware | Delaware Breakwater | 89 | Delaware Breakwater | 91 | 1880 | Fort Delaware | 101 | 1805 | 45 " |
| District of Columbia | Washington | 97 | Washington | 102 | 1879 | Washington | 103 | 1838 | 49 " |
| Florida | Sanford | 99 | Jacksonville | 104 | 1879 | Fort King | 103 | | 10 " |
| Georgia | Augusta | 100 | Augusta | 105 | 1878 | Forsyth | 106 | 1881 | 7 " |
| Do | Atlanta | 95 | Savannah | 105 | 1879 | McPherson Barracks | 107 | 1878 | 7 " |
| Idaho | Lewiston | 98 | Fort Lapwai | 104 | 1881 | Fort Boisé | 113 | | 15 " |
| Do | Couer d'Alene | 95 | Boisé City | 106 | 1877 | | | | |
| Illinois | Springfield | 95 | Springfield | 102 | 1879 | Chicago | 106 | 1868 | 39 " |
| Do | Chicago | 91 | Cairo | 99 | '74, '81 | | | | |
| Indiana | Indianapolis | 92 | Indianapolis | 101 | 1881 | Wabash | 104 | 1876 | 1 " |
| Do | | | | | | Spiceland | 100 | '64, '81 | 15 " |
| Indian Territory | Fort Sill | 102 | Fort Gibson | 109 | 1879 | Fort Sill | 109 | 1871 | 10 " |
| Do | | | Fort Sill | 100 | 1881 | Fort Arbuckle | 109 | 1856 | 20 " |
| Iowa | Des Moines | 97 | Dubuque | 101 | 1874 | Fort Madison | 105 | 1870 | 20 " |
| Do | Dubuque | 96 | Keokuk | 100 | 1874 | Brookstine | 105 | 1868 | 5 " |
| Kansas | Leavenworth | 96 | Dodge City | 108 | 1876 | Fort Larned | 115 | 1871 | 15 " |
| Kentucky | Louisville | 95 | Louisville | 102 | 1874 | Newport Barracks | 98 | | 29 " |
| Louisiana | Shreveport | 102 | Shreveport | 107 | 1875 | Baton Rouge | 102 | '77, '78 | 57 " |
| Maine | Portland | 89 | Portland | 97 | 1870 | Brunswick | 102 | 1808 | 53 " |
| Do | | | | | | Fort Preble | 101 | 1881 | 60 " |
| Maryland | Baltimore | 96 | Baltimore | 99 | '76, '79, '80 | Fort Washington | 102 | | 46 " |
| Do | | | | | | Fort McHenry | 102 | 1879 | 5! " |
| Massachusetts | Boston | 96 | Boston | 101 | 1880 | Westborough | 103 | 1870 | 7 " |
| Do | | | | | | Fort Warren | 100 | 1872 | 19 " |
| Michigan | Marquette | 94 | Detroit | 100 | 1878 | Marquette | 103 | 1862 | 9 " |
| Do | | | Marquette | 100 | 1878 | Monroe | 103 | 1866 | 11 " |
| Minnesota | Saint Paul | 100 | Saint Paul | 99 | 1874 | Fort Ripley | 103 | 1871 | 16 " |
| Do | Saint Vincent | 96 | Breckenridge | 97 | 1878 | Fort Snelling | 100 | 1838 | 62 " |
| Mississippi | Vicksburg | 96 | Vicksburg | 100 | '78, '81 | Brookhaven | 102 | 1880 | 7 " |
| Do | | | | | | Meridian | 104 | 1882 | 1 " |
| Missouri | Saint Louis | 96 | Saint Louis | 104 | 1881 | Allenton | 109 | 1868 | 4 " |
| Do | | | Springfield | 98 | 1882 | Saint Louis | 103 | | 38 " |
| Montana | Fort Custer | 97 | Fort Keogh | 109 | 1881 | Fort Shaw | 112 | 1872 | 13 " |
| Nebraska | Omaha | 99 | North Platte | 107 | 1877 | Fort McPherson | 115 | 1870 | 15 " |
| Do | North Platte | 95 | Omaha | 105 | 1874 | Glendale | 106 | 1868 | 2 " |
| Nevada | | | Winnemucca | 104 | 1877 | Camp Halleck | 110 | 1876 | 11 " |
| New Hampshire | Mount Washington | 60 | Mount Washington | 72 | 1881 | Stratford | 100 | 1808 | 11 " |
| New Jersey | Little Egg Harbor | 98 | Sandy Hook | 100 | 1876 | Haddonfield | 102 | 1866 | 7 " |
| New Mexico | Fort Bayard | 99 | La Mesilla | 107 | '80, '82 | Fort McRae | 116 | 1873 | 10 " |
| Do | | | Fort Bayard | 115 | 1882 | Fort Craig | 112 | 1857 | 29 " |
| New York | Albany | 94 | Oswego | 100 | 1878 | Newburg | 105 | 1849 | 40 " |
| Do | Oswego | 92 | New York City | 99 | 1876 | Fort Columbus | 104 | 1821 | 61 " |
| North Carolina | Kittyhawk | 100 | Wilmington | 103 | 1879 | Weldon | 107 | 1879 | 9 " |
| Do | Sloop Point | 100 | Charlotte | 101 | 1879 | Fort Johnson | 104 | 1831 | 57 " |
| Ohio | Columbus | 94 | Cincinnati | 103 | '74, '81 | Jacksonburg | 104 | 1881 | 8 " |
| Do | Toledo | 93 | Columbus | 103 | 1881 | Marietta | 102 | 1859 | 54 " |
| Oregon | Portland | 94 | Umatilla | 107 | 1880 | Fort Dalles | 105 | 1853 | 15 " |
| Pennsylvania | Philadelphia | 96 | Pittsburg | 103 | 1881 | Carlisle Barracks | 105 | 1808 | 38 " |
| Rhode Island | Narragansett Pier | 87 | Newport | 92 | 1878 | Fort Adams | 102 | 1869 | 41 " |
| South Carolina | Charleston | 101 | Charleston | 104 | 1879 | Charleston | 101 | 1752 | 105 " |
| Do | | | | | | Stateburg | 103 | 1881 | 2 " |
| Tennessee | Chattanooga | 97 | Chattanooga | 101 | 1879 | Castalian Springs | 103 | 1875 | 3 " |
| Do | Knoxville | 56 | Nashville | 101 | '74, '79 | Glenwood Cottage | 99 | 1860 | 11 " |
| Texas | El Paso | 110 | Eagle Pass | 112 | 1881 | Fort Mason | 114 | 1860 | 9 " |
| Do | Rio Grande City | 104 | Laredo | 110 | 1879 | Camp Stockton | 111 | | 16 " |
| Utah | Salt Lake City | 96 | Salt Lake City | 98 | 1877 | Camp Douglass | 103 | | 20 " |
| Do | | | | | | Mount Carmel | 112 | 1877 | 3 " |
| Vermont | | | Burlington | 96 | 1878 | Randolph | 102 | 1868 | 5 " |
| Virginia | Norfolk | 98 | Norfolk | 102 | '76, '79, '80, '81 | Dover Mines (near) | 104 | 1879 | 3 " |
| Do | | | | | | Fortress Monroe | 101 | 1851 | 57 " |
| Washington | Spokane Falls | 97 | Almota | 105 | 1882 | Fort Walla Walla | 107 | '59, '60 | 13 " |
| Do | Dayton | 98 | Dayton | 102 | 1880 | Cape Disappointment | 104 | 1865 | 9 " |
| West Virginia | | | Morgantown | 97 | 1874 | Flemington | 98 | 1881 | 1 " |
| Wisconsin | La Crosse | 95 | La Crosse | 101 | 1874 | Embarrass | 104 | 1866 | 14 " |
| Wyoming | Cheyenne | 94 | Cheyenne | 100 | 1881 | Fort Laramie | 107 | 1876 | 27 " |

*Texas.*—New Ulm, Austin county: mean temperature, 82°.0, is 0°.5 below the July normal of the last twelve years. The highest July mean of that period, 84°.4, occurred in 1879; the lowest, 80°.6, occurred in 1880.

*Vermont.*—Woodstock, Windsor county: mean temperature, 67°.8, is 0°.3 below the July normal of the last sixteen years. The highest July mean of that period, 71°.3, occurred in 1878; the lowest, 64°.3, occurred in 1869.

*Virginia.*—Variety Mills, Nelson county: mean temperature, 74°.6, is 1°.9 below the normal of the past six years. The highest July mean of that period, 79°.5, occurred in 1878: the lowest, 72°.5, occurred in 1882.

*West Virginia.*—Helvetia, Randolph county: mean temperature, 70°.0, is 0°.2 below the July average of seven years.

### MONTHLY RANGES OF TEMPERATURE.

The following stations report the largest monthly ranges of temperature for July:

Dayton, Washington Territory, 56°; Fort Shaw, Montana, 56°; Fort Meade, Dakota, 56°; Fort Buford, Dakota, 56°; Coeur d'Alene, Idaho, 55°; San Carlos, Arizona, 54°; Fort Custer, Montana, 54°; Marquette, Michigan, 54°; Saint Vincent, Minnesota, 53°; Huron, Dakota, 53°; Cheyenne, Wyoming, 53°; Wickenburg, Arizona, 52°; Fort Bennett, Dakota, 52°; Duluth, Minnesota, 52°; Fort Assinniboine, Montanna, 51°; Yankton, Dakota, 51°.

The stations reporting the smallest monthly ranges are as follows:

Fort Macon, North Carolina, 19°; Galveston, Texas, 20°; New Orleans, Louisiana, 20°; Indianola, Texas, 21°; Key West and Pensacola, Florida, 21°; Hatteras and Smithville, North Carolina, 22°; Cedar Keys, Florida, 23°; Portsmouth, North Carolina, 23°; Cape Mendocino, California, 24°; Palestine, Texas, 26°; Delaware Breakwater, Delaware, 27°, and 28° at the following stations: Grand Haven, Michigan; Buffalo, New York; Eastport, Maine; New River and Wilmington, North Carolina; Augusta and Savannah, Georgia; Jacksonville, Florida.

The greatest daily ranges have varied in the different districts as follows:

*New England.*—From 19° at Block Island, Rhode Island, on the 8th, and on the summit of Mount Washington, New Hampshire, on the 8th and 10th, to 33° at Boston, Massachusetts, on the 2d.

*Middle Atlantic states.*—From 17° at Cape May, New Jersey, on the 22d, to 29° at Washington, District of Columbia, on the 2d, and at Norfolk, Virginia, on same day.

*South Atlantic states.*—From 14° at Fort Macon, North Carolina, on the 27th, to 27° at Kittyhawk, North Carolina, on the 24th.

*Florida peninsula.*—From 16° at Key West, on the 7th, to 25° at Sanford, on the 9th.

*Eastern Gulf.*—From 16° at New Orleans, Louisiana, on the 18th, to 27° at Mobile, Alabama, on the 1st.

*Western Gulf.*—From 16° at Galveston, Texas, on the 19th and 29th, to 32° at Fort Smith, Arkansas, on the 10th.

*Tennessee.*—From 26° at Nashville, on the 20th, to 29° at Knoxville, on the 21st, and at Chattanooga, on the 20th and 21st.

*Ohio valley.*—From 22° at Cincinnati, Ohio, on the 3d, to 32° at Pittsburg, Pennsylvania, on the 5th.

*Lower lakes.*—From 21° at Buffalo, New York, on the 26th, to 31° at Oswego, New York, on the 27th.

*Upper lakes.*—From 21° at Grand Haven, Michigan, on the 1st, to 42° at Duluth, Minnesota, on same date.

*Extreme northwest.*—From 36° at Bismarck, Dakota, on the 22d, to 42° at Moorhead, Minnesota, on the 9th.

*Upper Mississippi valley.*—From 22° at Cairo, Illinois, on the 16th, to 32° at Des Moines and Dubuque, Iowa, on the 1st.

*Missouri valley.*—From 26° at Omaha, Nebraska, on the 15th, to 40° at Fort Bennett, Dakota, on the 25th.

*Northern slope.*—From 31° at North Platte, Nebraska, on the 15th, to 49° at Fort Shaw, Montana, on the 18th.

*Middle slope.*—From 34° at Denver, Colorado, on the 2d, to 47° at West Las Animas, Colorado, on the 18th.

*Southern slope.*—From 31° at Fort Concho, Texas, on the 22d, to 33° at Fort Stockton, Texas, on the 19th, 29th, and 30th.

*Southern plateau.*—From 29° at Fort Grant, Arizona, on the 17th, to 45° at Fort Apache, on the 17th.

*Northern plateau.*—From 41° at Spokane Falls, Washington territory, on the 17th, to 45° at Dayton, Washington territory, on same date.

*North Pacific coast.*—From 33° at Portland, Oregon, on the 5th, to 42° at Roseburg, Oregon, on same date.

*Middle Pacific coast.*—From 21° at San Francisco, California, on the 1st, to 37° at Sacramento, California, on the 11th and 25th.

*Table of Maximum and Minimum Temperatures for July, 1883.*

| State or Territory. | Signal Service. | | | U. S. Army Post Surgeons, or Voluntary Observers. | | |
|---|---|---|---|---|---|---|
| | Station. | Max. | Min. | Station. | Max. | Min. |
| | | ° | ° | | ° | ° |
| Alabama | Mobile | 100 | 71 | State Line | 107 | 66 |
| Do | Montgomery | 99 | 69 | Tuscaloosa | 101 | 53 |
| Arizona | Phœnix | 112 | 65 | Texas Hill | 115 | 80 |
| Do | Fort Apache | 97 | 51 | San Simon | 108 | 65 |
| Arkansas | Fort Smith | 100 | 64 | Brinkley | 101 | 49 |
| Do | Little Rock | 94 | 64 | Lead Hill | 100 | 61 |
| California | Red Bluff | 107 | 58 | Borden | 114 | 60 |
| Do | Cape Mendocino | 69 | 45 | Chualar | 80 | 40 |
| Colorado | West Las Animas | 100 | 56 | Fort Lewis | 87 | 45 |
| Connecticut | New Haven | 91 | 52 | Southington | 96 | 56 |
| Dakota | Yankton | 103 | 52 | Webster | 108 | 49 |
| Do | Fort Buford | 90 | 40 | Fort Meade | 98 | 35 |
| Delaware | Del. Breakwater | 89 | 62 | | | |
| District of Columbia | Washington | 97 | 62 | Rock Creek Bridge | 98 | 66 |
| Florida | Sanford | 99 | 70 | Live Oak | 104 | 65 |
| Do | Cedar Keys | 92 | 69 | Limona | 100 | 70 |
| Georgia | Augusta | 100 | 72 | Way Cross | 107 | 66 |
| Do | Atlanta | 95 | 64 | Gainesville | 98 | 47 |
| Idaho | Lewiston | 98 | 50 | | | |
| Do | Cœur d'Alene | 95 | 40 | | | |
| Illinois | Spingfield | 95 | 54 | Peoria | 98 | 52 |
| Do | Chicago | 91 | 51 | Riley | 93 | 46 |
| Indiana | Indianapolis | 92 | 57 | Laconia | 97 | 56 |
| Do | | | | Glenwood | 89 | 46 |
| Indian Territory | Fort Sill | 102 | 62 | | | |
| Iowa | Dubuque | 96 | 51 | Guttenburg | 100 | 54 |
| Do | Des Moines | 97 | 54 | Cedar Rapids | 93 | 46 |
| Kansas | Leavenworth | 96 | 59 | Clay Centre | 103 | 62 |
| Do | | | | Holton | 96 | 53 |
| Kentucky | Louisville | 95 | 61 | Bowling Green | 94 | 62 |
| Louisiana | Shreveport | 102 | 71 | Coushatta | 104 | 68 |
| Do | New Orleans | 94 | 74 | Amite City | 102 | 62 |
| Maine | Portland | 89 | 53 | Cornish | 93 | 52 |
| Do | Eastport | 76 | 48 | Gardiner | 85 | 44 |
| Maryland | Baltimore | 96 | 62 | Cumberland | 90 | 56 |
| Massachusetts | Boston | 96 | 51 | Westborough | 98 | 44 |
| Do | Thatcher's Island | 84 | 52 | Somerset | 97 | 50 |
| Michigan | Marquette | 94 | 40 | Thornville | 91 | 47 |
| Do | Detroit | 91 | 50 | Hillsdale | 89 | 43 |
| Minnesota | Saint Paul | 100 | 52 | Northfield | 94 | 44 |
| Do | Saint Vincent | 93 | 40 | Minneapolis | 94 | 57 |
| Mississippi | Vicksburg | 96 | 68 | Columbus | 107 | 63 |
| Do | | | | Aberdeen | 97 | 59 |
| Missouri | Saint Louis | 96 | 59 | Big Creek | 100 | 56 |
| Do | | | | Greenfield | 97 | 52 |
| Montana | Fort Custer | 97 | 43 | Fort Assinniboine | 97 | 40 |
| Do | Fort Shaw | 94 | 38 | Fort Shaw | 94 | 30 |
| Nebraska | Omaha | 99 | 55 | Lincoln | 106 | 61 |
| Do | North Platte | 95 | 54 | Fort Niobrara | 109 | 45 |
| Nevada | | | | Hot Springs | 104 | 50 |
| New Hampshire | Mount Washington | 60 | 27 | New Market | 94 | 48 |
| Do | | | | Grafton | 90 | 42 |
| New Jersey | Little Egg Harbor | 98 | 58 | Freehold | 98 | 51 |
| Do | Atlantic City | 94 | 57 | Vineland | 98 | 56 |
| New Mexico | Fort Bayard | 99 | 58 | Fort Union | 90 | 44 |
| New York | Albany | 94 | 54 | West Point | 95 | 50 |
| Do | Oswego | 92 | 52 | Madison Barracks | 83 | 44 |
| North Carolina | Kittyhawk | 100 | 64 | Wadesboro' | 104 | 63 |
| Do | Sloop Point | 100 | 63 | Salisbury | 104 | 60 |
| Ohio | Columbus | 94 | 54 | Canal Dover | 100 | 50 |
| Do | Toledo | 93 | 50 | Westerville | 91 | 47 |
| Oregon | Portland | 94 | 48 | Eola | 91 | 52 |
| Do | Roseburg | 93 | 46 | Albany | 89 | 54 |
| Pennsylvania | Erie | 88 | 52 | Fallsington | 93 | 57 |
| Do | Philadelphia | 96 | 54 | Wilkesbarre | 92 | 43 |
| Rhode Island | Narragansett Pier | 87 | 56 | | | |
| Do | Point Judith | 84 | 52 | | | |
| South Carolina | Charleston | 101 | 71 | Cheraw | 105 | 63 |
| Do | | | | Hardeeville | 103 | 53 |
| Tennessee | Chattanooga | 97 | 62 | Milan | 99 | 58 |
| Do | Knoxville | 96 | 58 | Paris | 98 | 57 |
| Texas | El Paso | 110 | 62 | Hempstead | 102 | 50 |
| Do | Fort Elliott | 96 | 54 | | | |
| Utah | Salt Lake City | 96 | 55 | Nephi | 93 | 62 |
| Vermont | | | | Woodstock | 90 | 39 |
| Virginia | Norfolk | 98 | 65 | Accotink | 98 | 60 |
| Do | Lynchburg | 97 | 58 | Snowville | 92 | 50 |
| Washington | Spokane Falls | 97 | 46 | Fort Spokane | 102 | 42 |
| Do | Dayton | 98 | 42 | | | |
| West Virginia | | | | Helvetia | 92 | 48 |
| Wisconsin | La Crosse | 95 | 52 | Neillsville | 97 | 42 |
| Do | Milwaukee | 90 | 50 | | | |
| Wyoming | Cheyenne | 94 | 44 | Fort Bridger | 89 | 32 |

*South Pacific coast.*—From 34° at Los Angeles, California, on the 24th and 30th, to 36° at Yuma, Arizona, on the 16th.

### HIGH TEMPERATURES.

Philadelphia, Pennsylvania.—The maximum temperature on the 6th was 95°. Thirteen cases of sunstroke occurred in this city, seven of which number resulted fatally.

Decatur, Illinois.—The temperature rose to 96° in the shade at this place on the 3d. Two cases of sunstroke occurred, neither of which proved fatal.

Cleveland, Ohio.—July 3d was the hottest day of this season; the thermometer rose to 96° in the shade and to 128° in the sun. Several cases of sunstroke occurred.

Vandalia, Illinois.—The thermometer indicated a temperature of 102° in the shade at this place on the 2d. The heat was so oppressive that all out-door work was generally abandoned during a greater part of the day.

Hillsboro', Illinois.—The 2d and 3d were the hottest days of the year at this place. The thermometer registered over 95° in the shade.

### FROSTS.

Factoryville, New York.—A light frost occurred at places in the valley on the morning of July 1st, but caused no damage.

Friendship, New York.—A light frost occurred in this locality on the morning of the 1st.

Light frosts occurred on the morning of the 8th at Lansing, Michigan, and at Embarrass, Wisconsin.

Davenport, Iowa.—A light frost occurred here on the morning of the 18th, causing no damage.

Boston, Massachusetts. — A telegram from the Crawford House, White Mountains, New Hampshire, states that a heavy frost occurred there during the night of the 25–26th.

At Wellsborough, Pennsylvenia, a light frost occurred on the morning of the 30th; minimum temperature, 45°

On the summit of Mount Washington, New Hampshire, frost occurred on the following dates: 1st, 9th, 10th, 19th, 20th, 21st, 24th, 25th, 26th.

### ICE.

The only instance of the formation of ice during July is reported from the Signal-Service station on the summit of Mount Washington, New Hampshire. On the morning of the 1st the thermometer recorded a minimum temperature of 27°, and ice formed to a thickness of nearly one inch.

## PRECIPITATION.

[*Expressed in inches and hundredths.*]

The distribution of rainfall for July, as determined from the reports from more than six hundred stations, is exhibited on chart iv.

In the lake region, New England, the Ohio and upper Mississippi valleys, and over the southern part of the United States from western Texas to Arizona, the monthly rainfall has exceeded the average for July. The excesses are largest in the upper lake region, Mew England, and in the upper Mississippi valley, where they are 2.06, 1.84, and 1.56, respectively. Deficiencies in the monthly rainfall have occurred in all parts of the country, with the exception of the above-named districts. Marked deficiencies occurred in the Gulf states, and in consequence severe droughts prevailed in some localities. The greatest departures below the average rainfall are, 2.54 in the eastern Gulf states; 1.72 in the western Gulf states; 1.28 in Florida; 1.12 in the northern slope; and 1.07 in the Missouri valley. No rain fell at any of the stations in the Pacific states, except .01 at Roseburg, Oregon, and an inappreciable amount at Los Angeles, California. In the middle and south Atlantic states the rainfall for the month is about three-fourths of an inch below the average for July.

In the first column of the following table is given the average rainfall for July in the various districts for several years; in the second column is given the average of July, 1883; and the third column shows the excess or deficiency of July, 1883, as compared with the average of that month in previous years:

*Average precipitation for July, 1883.*

| Districts. | Average for July. Signal-Service observations. | | Comparison of July, 1883, with the average for several years. |
|---|---|---|---|
| | For several years. | For 1883. | |
| | *Inches.* | *Inches.* | *Inches.* |
| New England | 3.92 | 5.76 | 1.84 excess. |
| Middle Atlantic states | 4.04 | 3.28 | 0.76 deficiency. |
| South Atlantic states | 5.65 | 4.92 | 0.73 deficiency. |
| Florida peninsula | 5.77 | 4.49 | 1.28 deficiency. |
| East Gulf | 5.04 | 2.50 | 2.54 deficiency. |
| West Gulf | 4.16 | 2.44 | 1.72 deficiency. |
| Tennessee | 4.06 | 3.07 | 0.99 deficiency. |
| Ohio valley | 4.55 | 5.35 | 0.80 excess. |
| Lower lakes | 3.84 | 4.51 | 0.67 excess. |
| Upper lakes | 3.36 | 5.42 | 2.06 excess. |
| Extreme northwest | 2.83 | 2.44 | 0.39 deficiency. |
| Upper Mississippi valley | 4.02 | 5.58 | 1.56 excess. |
| Missouri valley | 4.44 | 3.37 | 1.07 deficiency. |
| Northern slope | 1.94 | 0.82 | 1.12 deficiency. |
| Middle slope | 2.77 | 2.57 | 0.20 deficiency. |
| Southern slope | 2.50 | 3.19 | 0.69 excess. |
| Northern plateau | 1.01 | 0.00 | 1.01 deficiency. |
| Southern plateau | 2.35 | 2.50 | 0.15 excess. |
| North Pacific coast | 0.58 | 0.00 | 0.58 deficiency. |
| Middle Pacific coast | 0.01 | 0.00 | 0.01 deficiency. |
| South Pacific coast | 0.08 | 0.15 | 0.07 excess. |
| Mount Washington, N. H. | 7.43 | 11.14 | 3.71 excess. |
| Pike's Peak, Col. | 4.89 | 5.37 | 0.48 excess. |
| Salt Lake City, Utah | 0.68 | 0.10 | 0.58 deficiency. |

**The general distribution of rainfall for the month of July, with the districts of maximum departures from the normal, in each year since 1873, are as follows:**

| Districts. | Maximum departures. | Year. | Remarks. |
|---|---|---|---|
| | | 1873... | Excessive over the northern districts from the upper lakes to the New England coast; normal in the south Atlantic and Gulf states; deficient in the Ohio, Mississippi, and Missouri valleys. |
| Western Gulf | + 4.20 | 1874... | Excessive in the Saint Lawrence valley, lower lake region, New England, and in the south Atlantic and Gulf states; deficient in other districts, except normal in the middle Atlantic states. |
| Eastern Gulf | + 1.85 | | |
| Saint Lawrence valley | + 1.40 | | |
| Minnesota | — 3.10 | | |
| Upper Mississippi valley | — 0.85 | | |
| Ohio valley | + 5.60 | 1875... | Large excesses in the upper Mississippi, lower Missouri, and Ohio valleys, and a slight excess in New England; large deficiencies on the Pacific coast, in Minnesota, and in the south Atlantic and Gulf states, slight deficiencies in the lake region and Saint Lawrence valley; normal in the middle Atlantic states. In the Ohio valley the rainfall was nearly three times as great as the normal. |
| Missouri valley | + 4.80 | | |
| Upper Mississippi valley | + 2.75 | | |
| South Atlantic states | — 4.85 | | |
| Minnesota | — 4.11 | | |
| Eastern Gulf | — 3.55 | | |
| Lower Missouri valley | + 3.35 | 1876... | Deficient in the upper Missouri and Ohio valleys, Tennessee, west Gulf states, and on the Pacific coast; excessive in all other districts. |
| Eastern Gulf | + 2.10 | | |
| Upper Mississippi valley | + 1.25 | | |
| Western Gulf | — 0.90 | | |
| Ohio valley and Tennessee | — 0.25 | | |
| South Atlantic states | + 1.38 | 1877... | Excessive in the middle and south Atlantic states; normal in Minnesota, New England, and on the Pacific coast; deficient in the lake region, and in the Ohio, Saint Lawrence, upper Mississippi, and Missouri valleys. |
| Middle Atlantic states | + 1.28 | | |
| Ohio valley | — 3.74 | | |
| Saint Lawrence valley | — 0.83 | | |
| Lower lakes | + 1.98 | 1878... | Deficient in the east Gulf states, Ohio valley, New England, and in California; excessive in all other districts. |
| Tennessee | + 1.83 | | |
| Upper Missouri valley | + 1.40 | | |
| Eastern Gulf | — 1.36 | | |
| Ohio valley | — 0.09 | | |
| Minnesota | + 3.63 | 1879... | Deficient in the middle Atlantic and west Gulf states, in the Ohio and lower Missouri valleys, and in California; excessive in all other districts, the departures being very slight in the lower lakes and south Atlantic states. |
| Upper Missouri valley | + 3.40 | | |
| Eastern Gulf | + 2.46 | | |
| Western Gulf | — 1.15 | | |
| Ohio valley | — 1.09 | | |
| Western Gulf | + 2.84 | 1880... | Deficient on the Pacific coast, in Florida, Tennessee, Minnesota, and in the upper Missouri and upper Mississippi valleys; normal in the lower lakes and lower Missouri valley; excessive in the upper lakes, Saint Lawrence valley, and in the states bordering on the Atlantic ocean and Gulf of Mexico, except in Florida. |
| South Atlantic states | + 1.73 | | |
| Middle Atlantic states | + 1.08 | | |
| Ohio valley | — 2.71 | | |
| Upper Missouri valley | — 1.59 | | |
| Upper Mississippi valley | — 1.58 | | |
| Florida | + 1.82 | 1881... | Excessive in the north Pacific coast region, Florida, the south Atlantic states, upper lake region, and upper Mississippi valley, the departures in the two latter districts being very slight; deficient in all other parts of the country, except normal in California. |
| South Atlantic states | + 0.77 | | |
| Ohio valley | — 2.58 | | |
| Tennessee | — 2.40 | | |
| Eastern Gulf | — 2.16 | | |
| Middle Atlantic states | — 2.05 | | |
| Southern slope | + 3.04 | 1882... | Excessive in the south Atlantic and Gulf states, southern slope, extreme northwest, and north Pacific coast region, the departures being very small in the last-named district; deficient in all other districts, except normal in California. |
| Western Gulf | + 1.95 | | |
| South Atlantic states | + 1.73 | | |
| Ohio valley | — 1.74 | | |
| Missouri valley | — 1.42 | | |
| Lower lakes | — 1.34 | | |

*Table of Excessive, Greatest, and Least Monthly Rainfalls.*

| Station. | Specially heavy. | | | Largest monthly. | Smallest monthly. | |
|---|---|---|---|---|---|---|
| | Date. | Amt. | Duration | Amount. | Station. | Amt. |
| *Arkansas.* | | | | | *Arizona.* | |
| Lead Hill | 8 | 2.15 | | 11.60 | Yuma | t'ce |
| Do | 14 | 4.68 | 14 hours | | Phœnix | 0.07 |
| Mount Ida | 31 | 2.75 | 1hr. 30 m. | | *California.* | |
| Fort Smith | 14 | 2.01 | | | Alta | 0.00 |
| *Connecticut.* | | | | | Alcatraz Island | 0.00 |
| New London | 15, 16 | 2.06 | 9 hours | 7.84 | Anaheim | 0.00 |
| Do | 28, 29 | 2.10 | 10 hours | | Angel Island | 0.00 |
| New Haven | 28 | 3.62 | 8 hours | | Antioch | 0.00 |
| *Dakota.* | | | | | Auburn | 0.00 |
| Huron | 5, 6 | 2.21 | | | Benecia Barracks | 0.00 |
| Fort Randall | 29 | 2.30 | | | Borden | 0.00 |
| *Florida.* | | | | | Brentwood | 0.00 |
| Live Oak | | | | 7.85 | Brighton | 0.00 |
| Jacksonville | | | | 6.88 | Caliente | 0.00 |
| Archer | 20 | 2.02 | 1 hour | 6.55 | Calistoga | 0.00 |
| Saint Augustine | 18 | 2.80 | | | Cape Mendocino | 0.00 |
| *Georgia.* | | | | | Chico | 0.00 |
| Brunswick | 26 | 2.00 | | 7.77 | Cisco | 0.00 |
| Savannah | 1 | 1.61 | 2 hours | | Colton | 0.00 |
| *Illinois.* | | | | | Davis | 0.00 |
| Cairo | 12 | 2.02 | | 9.75 | Dunnigan | 0.00 |
| Mattoon | 7 | 2.45 | | | Emigrant Gap | 0.00 |
| Springfield | 16 | 1.35 | 1 hr. 35 m. | | Farmington | 0.00 |
| *Indiana.* | | | | | Fort Gaston | 0.00 |
| Miami | | | | 7.72 | Fresno | 0.00 |
| Greencastle | 12 | 2.24 | | 6.18 | Galt | 0.00 |
| Kokomo | 23 | 2.60 | | 6.11 | Gilroy | 0.00 |
| Indianapolis | | | | 6.12 | Goshen | 0.00 |
| Mitchell | 8 | 2.00 | | | Hollister | 0.00 |
| La Porte | 23 | 2.00 | | | Indio | 0.00 |
| *Iowa.* | | | | | Ione | 0.00 |
| Cresco | 20 | 4.92 | | 12.70 | Keen | 0.00 |
| Do | 23 | 3.19 | | | Kingsbury | 0.00 |
| Monticello | 14 | 2.84 | | 10.93 | Knight's Landing | 0.00 |
| Do | 23 | 2.11 | | | Lathrop | 0.00 |
| Guttenburg | 16 | 2.37 | | 10.01 | Lemoore | 0.00 |
| Do | 23 | 3.58 | | | Livermore | 0.00 |
| Dubuque | 4 | 2.13 | | 7.90 | Marysville | 0.00 |
| Do | 23 | 2.31 | | | Menlo Park | 0.00 |
| Fort Madison | 10 | 2.40 | | 7.90 | Merced | 0.00 |
| Independence | | | | 7.52 | Modesto | 0.00 |
| Ames | 4 | 4.54 | | 6.30 | Mojave | 0.00 |
| Humboldt | 22, 23 | 2.12 | 12 hours | 6.12 | Monterey | 0.00 |
| *Kansas.* | | | | | Napa | 0.00 |
| Elk Falls | 7 | 2.00 | | 8.50 | Newhall | 0.00 |
| Do | 27 | 2.50 | | | Niles | 0.00 |
| South Haven | | | | 7.37 | Oakland | 0.00 |
| Wellington | 26 | 2.10 | | 6.64 | Oakwood | 0.00 |
| Oxford | | | | 6.64 | Orland | 0.00 |
| Topeka | 10 | 2.93 | | 6.52 | Pejaro | 0.00 |
| Belle Plaine | | | | 6.20 | Petaluma | 0.00 |
| Clay Centre | 29, 30 | 2.07 | | | Pleasanton | 0.00 |
| Fort Scott | 26, 27 | 2.12 | | | Princeton | 0.00 |
| Independence | 13, 14 | 2.67 | 18 hours | | Ravenna | 0.00 |
| Leavenworth | 30 | 2.03 | | | Red Bluff | 0.00 |
| Pretty Prairie | 26, 27 | 2.33 | | | Reading | 0.00 |
| *Kentucky.* | | | | | Rocklin | 0.00 |
| Louisville | 16 | 2.00 | | | Sacramento | 0.00 |
| *Louisiana.* | | | | | Salinas City | 0.00 |
| New Orleans | 9 | 1.25 | 1 hr. 10 m. | | San Fernando | 0.00 |
| *Maine.* | | | | | San Francisco | 0.00 |
| Eastport | 14 | 5.24 | 10 hours | 9.07 | San Jose | 0.00 |
| Orono | | | | 6.90 | San Mateo | 0.00 |
| Cornish | | | | 6.21 | Santa Cruz | 0.00 |
| *Massachusetts.* | | | | | Suisun | 0.00 |
| New Bedford | 28, 29 | 4.83 | 16 h 30 m. | 6.92 | Solidad | 0.00 |
| Provincetown | 28, 29 | 3.59 | | | South Vallejo | 0.00 |
| *Michigan.* | | | | | Sumner | 0.00 |
| Lansing | 21 | 3.43 | | 10.12 | Stockton | 0.00 |
| Grand Haven | 20, 21 | 3.65 | | 7.96 | Tehachapi | 0.00 |
| Northport | 6, 7 | 2.35 | | 7.00 | Tehama | 0.00 |
| Do | 27 | 2.25 | | | Tracy | 0.00 |
| Ionia | | | | 7.44 | Tulare | 0.00 |
| Traverse City | | | | 6.52 | Turlock | 0.00 |
| Thornville | | | | 6.52 | Williams | 0.00 |
| Fort Brady | 10,11,12 | 4.20 | | 6.02 | Willows | 0.00 |
| *Minnesota.* | | | | | Woodland | 0.00 |
| Northfield | | | | 6.73 | Fort Bidwell | t'ce |
| Fort Snelling | 5, 6 | 2.50 | 19 h. 30 m. | | Los Angeles | t'ce |
| Minneapolis | 6 | 2.65 | | | *Idaho.* | |
| Saint Paul | 6 | 2.32 | | | Coeur d'Alene | 0.00 |
| *Missouri.* | | | | | *Louisiana.* | |
| Carthage | | | | 12.18 | Shreveport | 0.22 |
| Pierce City | 14 | 5.00 | 18 hours | 9.30 | *Montana.* | |
| Do | 19 | 2.10 | 1 hour | | Fort Shaw | 0.15 |
| Greenfield | | | | 9.00 | Fort Assininiboine | 0.24 |
| Sedalia | | | | 7.83 | Helena | 0.32 |
| Lamar | | | | 7.55 | Fort Ellis | 0.41 |
| Shelbina | | | | 7.15 | *Nevada.* | |
| Pleasant Hill | | | | 7.05 | Beowawe | 0.00 |
| Miami | | | | 6.88 | Brown's | 0.00 |
| Lexington | | | | 6.86 | Carlin | 0.00 |
| Macon | | | | 6.68 | Carson City | 0.00 |
| *New Hampshire.* | | | | | Elko | 0.00 |
| Mount Washington | 4, 5 | 3.58 | | 11.14 | Golconda | 0.00 |
| New Market | 4, 5 | 3.66 | | 7.29 | Humboldt | 0.00 |
| Wolfsboro' | | | | 6.92 | Otego | 0.00 |
| Woodstock | | | | 6.30 | Palisade | 0.00 |
| Antrim | 15 | 3.00 | | | Wadsworth | 0.00 |
| *New York.* | | | | | Winnemucca | 0.00 |
| Menand Station | 12, 13 | 2.87 | | 6.78 | Tecoma | 0.05 |
| Humphrey | | | | 6.69 | Hot Springs | 0.20 |
| Port Jervis | | | | 6.47 | Reno | 0.20 |
| *North Carolina.* | | | | | Wells | 0.23 |
| Sloop Point | 25 | 2.87 | | 10.09 | Toano | 0.33 |

*Table of Excessive, Greatest, and Least Monthly Rainfalls.*—Continued.

| Station. | Specially heavy. | | | Largest monthly. | Smallest monthly. | |
|---|---|---|---|---|---|---|
| | Date. | Amt. | Duration. | Amount. | Station. | Amt. |
| *North Carolina.*—Cont'd. | | | | | *Nevada.*—Continued. | |
| Goldsboro' | | | | 7.43 | Battle Mountain | t'ce |
| Fort Macon | 18 | 2.39 | | 6.71 | *North Carolina.* | |
| Portsmouth | 9, 10 | 3.66 | | 6.41 | Brevard | 0.10 |
| Hatteras | 9, 10 | 2.63 | | 6.20 | *Oregon.* | |
| Do | 30 | 1.60 | 1 hr. 10 m. | | Albany | 0.00 |
| Charlotte | 5 | 1.43 | 1 hr. 30 m. | | Eola | 0.00 |
| Do | 24, 25 | 2.23 | | | Portland | 0.00 |
| Lenoir | 28 | 2.50 | 1 hr. 5 m. | | Roseburg | 0.01 |
| *Pennsylvania.* | | | | | *Utah.* | |
| Wellsborough | | | | 10.24 | Ogden | t'ce |
| Franklin | | | | 7.17 | Salt Lake City | 0.10 |
| Wilkesbarre | | | | 7.08 | Terrace | 0.15 |
| Blooming Grove | | | | 6.10 | Blue Creek | 0.13 |
| Grampian Hills | 8 | 1.90 | | 6.05 | Kelton | 0.50 |
| *Rhode Island.* | | | | | *Virginia.* | |
| Narragansett Pier | | | | 6.09 | Lynchburg | 0.19 |
| *South Carolina.* | | | | | *Washington.* | |
| Charleston | 9, 10 | 2.41 | | 8.93 | Fort Canby | 0.00 |
| Do | 30, 31 | 2.77 | | | Dayton | 0.00 |
| *Tennessee.* | | | | | Fort Spokane | 0.00 |
| Ashwood | | | | 7.30 | *Wyoming.* | |
| Gadsden | | | | 6.99 | Fort Bridger | 0.16 |
| Dyersburg | | | | 6.45 | | |
| Bolivar | | | | 6.44 | | |
| Milan | 30 | 2.16 | | | | |
| *Texas.* | | | | | | |
| Brownsville | 1 | 2.34 | | | | |
| Fort Stockton | 8 | 2.34 | | | | |
| Fort Concho | 7 | 2.21 | | | | |
| *Vermont.* | | | | | | |
| Strafford | | | | 6.00 | | |
| *Virginia.* | | | | | | |
| Cape Henry | 17 | 1.50 | 1 hr. 45 m. | | | |
| *West Virginia.* | | | | | | |
| Helvetia | 24 | 2.16 | | 7.84 | | |
| *Wisconsin.* | | | | | | |
| Manitowoc | 21 | 3.41 | | 13.68 | | |
| Ripon | 23 | 3.34 | | 12.59 | | |
| La Crosse | 20 | 2.60 | 2 hr. 30 m. | 11.03 | | |
| Do | 22, 23 | 4.65 | | | | |
| Madison | 21 | 2.05 | | 8.99 | | |
| Sussex | | | | 8.78 | | |
| Neillsville | 20, 21 | 3.80 | | 8.40 | | |
| Embarrass | 3 | 2.20 | | 7.80 | | |
| Milwaukee | | | | 7.13 | | |

## DEVIATIONS FROM AVERAGE PRECIPITATION.

The departures exhibited by the reports from the regular Signal-Service stations are shown in the table of average precipitation for July, 1883. Voluntary observers report the following notes in connection with this subject:

*Illinois.*—Anna, Union county: monthly rainfall, 2.86, is 1.69 below the July average of the last eight years. The largest July rainfall of that period, 11.09, occurred in 1875; in July, 1881, no rain fell during the entire month.

Riley, McHenry county: monthly rainfall, 2.94, is 1.14 below the July average of the last twenty-two years.

*Indiana.*—Vevay, Switzerland county: monthly rainfall, 4.83, is 0.68 above the July average of the last eight years.

Wabash, Wabash county: monthly rainfall, 5.08, is 1.64 above the July average of the last seven years.

*Kansas.*—Yates Centre, Woodson county: monthly rainfall, 3.12, is 0.52 below the July average of the last three years.

Manhattan, Riley county: monthly rainfall, 4.15, is 0.51 below the July average of twenty-four years.

Lawrence, Douglas county: monthly rainfall, 7.23, is 2.94 above the July average of sixteen years, and with but one exception [7.30 in 1871] is the largest July precipitation of that period; the smallest July rainfall, 1.19, occurred in 1874.

Wellington, Sumner county: monthly rainfall, 6.64, is 2.87 above the July average of the last four years, and is the largest July rainfall of that period; the smallest, 2.52, occurred in 1879. The total rainfall for the first seven months of 1883 is 25.81, or an excess of 7.60 over the average of the same months in the four preceding years.

*Maine.*—Gardiner, Kennebec county: monthly rainfall, 3.49, is 0.13 above the July average of the last forty-seven years.

*New Hampshire.*—Antrim, Hillsborough county: monthly rainfall, 5.55, is 0.77 above the July average of a period of ten years.

Grafton, Grafton county: monthly rainfall, 4.81, is 0.63 above the July average of the last five years.

*New York.*—Palermo, Oswego county: monthly rainfall, 3.17, is 0.16 above the July average of the last thirty years. The largest July rainfall of that period, 6.60, occurred in 1874; the smallest, 0.62, occurred in 1882.

North Volney, Oswego county: monthly rainfall, 3.95, is 0.24 above the July average of the last twelve years.

*Ohio.*—Wauseon, Fulton county: monthly rainfall, 6.44, is 2.08 above the July average of the last eleven years. The largest monthly rainfall of that period, 7.26, occurred in 1872; the smallest, 1.60, occurred in 1875.

*Pennsylvania.*—Dyberry county: monthly rainfall, 5.02, is 0.02 above the July average of the last twelve years. The largest monthly rainfall of that period, 7.68, occurred in 1871; the smallest, 2.71, occurred in 1869.

*Texas.*—New Ulm, Austin county: monthly rainfall, 1.22, is 3.75 below the July average of the last twelve years. The largest July rainfall of that period, 14.38, occurred in 1873; the smallest, 0.90, occurred in 1872.

*Vermont.*—Woodstock, Windsor county: monthly rainfall, 5.56, is 1.47 above the July average of the last fifteen years. The largest July rainfall of that period, 7.61, occurred in 1873; the smallest, 1.76, occurred in 1869.

*Virginia.*—Variety Mills, Nelson county: monthly rainfall, 1.68, is 1.78 below the July average of five years.

*West Virginia.*—Helvetia, Randolph county: monthly rainfall, 7.84, is 0.57 above the average of seven years.

*Wisconsin.*—Manitowoc, Manitowoc county: the general average rainfall for all months of the year at this station, as determined from a record covering a period of twenty years, is 3.16. The rainfall for July, 1883, (13.68,) exceeds the general average by 10.52, and is 4.87 greater than has been previously recorded in any one month of the record, the next largest being 8.81 for September, 1881.

## HAIL.

*Arkansas.*—Hot Springs, Garland county: the hail storm of the 18th caused great damage to the grape crops at points south of this place. It is estimated that about one-third of the crops was destroyed.

*Colorado.*—Fort Collins, Larimer county: a destructive hail storm passed over this county on the afternoon of the 3d, the hailstones covering the ground, in some places, to a depth of five inches. Growing crops in the track of the storm were totally destroyed. The losses are estimated at $30,000.

*Dakota.*—Morriston, Davidson county: a destructive hail storm occurred on the 8th, beginning at a point about twenty miles south of this place and pursuing a southerly course for about thirty miles. The width of the storm's path averaged about two and one-half miles, within which all crops were destroyed. All window-glass on the north and east sides of buildings was broken, and much poultry was killed. The greatest damage was done in the vicinity of Scotland, a station on the Running Water Branch of the Chicago, Milwaukee, and Saint Paul railroad.

Huron: from 3.20 to 3.40 p. m. of the 8th small hail fell at this station. At a point two and one-half miles south the hailstones were as large as walnuts and fell to a considerable depth. On Pearl creek (thirteen miles southeast) the storm was very severe, and caused a great deal of damage to the crops in that locality. It appears that the path of this storm was not more than two and one-half miles wide; its course was from northwest to southeast. A hail storm of considerable severity also occurred at Huron on the 18th. On the 23d, at Lake Byron, eighteen miles northeast of this place, a violent hail storm occurred. The hailstones were remarkably large, and were found to be mixed with sand. Prairie chickens and other birds in the path of the storm were killed. Thousands of acres of grain were destroyed. A number of hailstones were brought a distance of ten miles to this city, and after having been exposed to the heat for one hour, were found to measure two and one-half inches in diameter.

Redfield, Spink county: at 6 a. m. of the 23d, a destructive hail storm passed over this place, lasting about thirty minutes and doing much damage to the crops.

Fort Buford: between 5 and 6 p. m. of the 11th hail fell for about twenty minutes, causing slight damage to the post garden.

*Illinois.*—Macomb, McDonough county: at 10.15 p. m. of the 12th the heaviest hail storm occurred that has been known at this place for many years. The storm came from the northwest, its path varying from three to eight miles in width. All unharvested grain within the track of the storm was completely ruined, and more than half the apple crop was beaten from the trees; the grape crop was entirely ruined.

Galesburg, Knox county: between 9 and 10 p. m. of the 13th a hail storm of unusual severity passed over this city; nearly every window of northern exposure in the city was broken by the hailstones, which were very large. Corn, oats, and wheat in this vicinity were badly damaged.

Havana, Mason county: at 11 p. m. of the 13th a terrific rain and hail storm visited this region. Hailstones of unusually large size fell, causing great damage to wheat, oats, and corn. Windows were broken, fowls killed, and stock injured by the hailstones. The storm passed from north to southeast, and its path was about two miles in width.

The following extract is taken from the "Chicago Inter-Ocean" of July 14, 1883:

> Vessel and tug masters who were twenty to thirty miles northeast of Chicago on the lake at 6 o'clock Thursday evening, July 12th, report a most remarkable occurrence. They say that there was heavy thunder and lightning out of a clear sky, and that for half an hour there was a shower of hail or ice, such as they never before witnessed or heard of. At first it was ordinary hail, but the "stones" speedily grew in size, and came pelting down in great nuggets as large as geese eggs. One lump of ice that struck and remained on the tug Mary McLane's deck was as large as a brick, and weighed fully two pounds. This huge missel made a deep dent in the deck when it struck, and the deckhand narrowly escaped it. It was put in the cook's refrigerator and kept until last evening, and was shown to numerous curious people.
>
> When the captains who encountered this remarkable storm outside were told that there was no hail storm ashore here Thursday evening they were incredulous and refused to believe it. At about 6 o'clock Thursday evening there was heavy thunder here which came out of a clear sky, but no lightning, rain, or hail. The weather Thursday night was cold enough for November, as it was also last night. It is certainly a most remarkable season.

Urbana, Champaign county: reports from points fourteen miles northwest of here, state that a destructive hail storm visited that locality on the 16th. It is stated that the hailstones were as large as bricks, many of them measuring twelve inches in circumference and that they broke through the roofs and weather-boarding of houses.

*Iowa.*—Davenport: a violent hail storm occurred in the northern part of this (Scott) county on the night of the 12–13th. The fall of hail is said to have been the heaviest ever known in this part of the country. The track of the storm was from three to four miles wide, and about ten miles in length. Along the course of the storm, the fields of grain were beaten to the ground, and the corn was entirely stripped of its blades. The damage to crops and other property in this county is estimated at $15,000. Some of the hailstones were as large as English walnuts and fell to depths of from three to five inches, and remained on the ground until the following morning.

Roseberry: a heavy wind and hail storm passed over this section at about 1.30 p. m. of the 13th, lasting one hour. Great damage was done to growing crops, the corn being cut to pieces. Several houses and barns near here were blown down.

Sidney, Fremont county: this section was visited by a terrific wind, rain, and hail storm at about noon of the 13th. Reports from all points within a radius of from ten to twelve miles of this place state that the growing corn and fields of grain were almost entirely destroyed. All windows of northwestern exposure were broken, and stock was injured to some extent by the hailstones.

Dubuque: a destructive wind and hail storm occurred at this place on the 20th. Outbuildings and trees were blown down, and the corn and grain crops within the path of the storm were

ruined. The hail-belt was about one half of a mile in width, and extended from northwest to southeast.

*Minnesota.*—Lake Benton, Lincoln county: the hail storm of the evening of the 19th was one of the severest that has ever visited this section. A number of farmers in this locality sustained heavy losses, their crops being badly damaged, and in some instances fields of grain were entirely destroyed.

*Nebraska.*—Johnson, Nemaha county: at 12.30 p. m. of the 13th a very destructive hail storm occurred in this county. The path of the storm was about two miles in width and seven miles in length. The damage to crops in this locality is estimated at $20,000. The hailstones varied from one-eighth to three-fourths of an inch in diameter, were very hard and of irregular shapes.

Louisville, Cass county: a very severe hail storm occurred at this place on the 13th. Window-glass was broken in nearly every house in the town. Crops in the locality were completely ruined.

Austin, Sherman county: hail storms occurred at this place on the 11th and 15th, causing damage to crops.

*New Jersey.*—Ocean Beach: a severe hail and wind storm passed over this place during the night of 12th–13th, breaking many windows and causing other damage. A large barn was demolished and several buildings were unroofed.

*New York.*—Albany: a severe hail storm passed over this place during the night of the 12–13th, doing great damage to crops and fruit trees, and breaking many windows.

*Pennsylvania.*—Lancaster, Lancaster county: reports from various parts of this county show that the hail storm of the night of the 28th–29th destroyed more than 1,000 acres of growing tobacco.

*Wisconsin.*—Eau Claire, Eau Claire county: a severe hail and thunder storm occurred in this vicinity on the afternoon of the 3d, doing great damage to buildings, crops, etc. The storm was especially severe in the vicinity of New Chicago and Mondovi; at the latter place five barns were destroyed.

Hail storms of less severity occurred in the various states and territories as follows:

*Arizona.*—Fort Bowie, 26th; Fort Grant, 31st.

*Arkansas.*—Little Rock, 4th and 8th.

*Colorado.*—Fort Lewis, 3d; Pike's Peak, 4th; Fort Garland, 21st.

*Dakota.*—Fort Yates, 10th and 15th; Yankton, 15th; Deadwood, 22d; Bismarck, 23d.

*Georgia.*—Atlanta, 24th; Brunswick, 26th.

*Illinois.*—Morrison, 11th; Riley, 21st.

*Indiana.*—Logansport, 4th; Indianapolis, 12th.

*Iowa.*—Independence, 12th; Cresco, 15th and 18th; Monticello and Davenport, 20th.

*Kansas.*—Topeka, 10th.

*Maine.*—Gardiner, 31st.

*Michigan.*—Thornville, 3d; Swartz Creek, 4th; Fort Brady, 11th; Ionia, 16th; Lansing, 21st.

*Montana.*—Fort Keogh, 6th.

*Nebraska.*—Marquette, 12th; Genoa, Fremont, and Red Willow, 13th.

*New Hampshire.*—Grafton, 4th; New Market, 4th and 5th; Mount Washington, 29th, 30th, and 31st.

*New Mexico.*—Fort Cummings, 12th; Fort Union, 15th; Fort Wingate, 18th.

*New York.*—Factoryville, 2d and 3d; Menand station (near Albany), 12th.

*North Carolina.*—Lenoir, 28th.

*Pennsylvania.*—Wellsboro', 2d; Leetsdale and Grampian Hills, 23d,

*Tennessee.*—Austin, 2d; Nashville, 3d and 24th.

*Wisconsin.*—Ripon, 2d; Sussex, 16th; Neillsville, 21st; Beloit, 22d.

### SNOW.

Snow fell on the summit of Pike's Peak, Colorado, on the following dates: 4th, from 6th to 9th, 13th, 14th, 15th, 27th. The total depth of snowfall for the month was about twenty-three inches, of which amount more than eighteen inches fell during the snow storm of the 6th and 7th. At the end of the month the snow had not entirely disappeared from the ground.

The "Lancaster (New Hampshire) Republican," of August 1st, states that, during last week, Colebrook (Coos county) was visited by quite a heavy hail and snow storm. The area over which the storm prevailed was only about one mile in width, and two miles in length. Snow fell to a depth averaging nearly six inches.

### SLEET.

Sleet fell on the summit of Pike's Peak, Colorado, on the 4th, 5th, 9th, and 24th.

*Table of rainy and cloudy days, relative humidity, and dew-point for July, 1883.*

| Districts. | Rainy days. | Cloudy days. | Rel. humidity.* | Dew-point. |
|---|---|---|---|---|
| | | | *Percentages.* | ° ° |
| New England | From 8 to 14 | From 1 to 5 | From 70.8 to 82.2 | From 52.9 to 63.9 |
| Middle Atlantic states | " 6 " 18 | " 1 " 6 | " 60.2 " 81.7 | " 59.1 " 69.3 |
| South Atlantic states | " 8 " 18 | " 1 " 12 | " 60.8 " 81.5 | " 63.8 " 76.7 |
| Florida peninsula | " 10 " 15 | " 1 " 4 | " 69.4 " 73.9 | " 73.0 " 74.4 |
| East Gulf | " 9 " 15 | " 0 " 2 | " 65.1 " 76.0 | " 68.3 " 73.5 |
| West Gulf | " 4 " 14 | " 1 " 5 | " 60.4 " 78.7 | " 69.9 " 74.6 |
| Tennessee | " 14 " 18 | " 2 " 8 | " 63.6 " 75.9 | " 63.8 " 69.2 |
| Ohio valley | " 11 " 15 | " 4 " 6 | " 64.0 " 70.7 | " 60.1 " 65.1 |
| Lower lakes | " 13 " 23 | " 3 " 9 | " 66.9 " 75.9 | " 58.3 " 61.3 |
| Upper lakes | " 11 " 21 | " 5 " 9 | " 65.4 " 80.3 | " 50.9 " 60.2 |
| Extreme northwest | " 10 " 14 | " 3 " 4 | " 60.9 " 75.0 | " 50.1 " 55.3 |
| Upper Mississippi valley | " 11 " 17 | " 4 " 10 | " 67.2 " 71.5 | " 59.0 " 63.3 |
| Missouri valley | " 11 " 14 | " 4 " 7 | " 66.1 " 75.8 | " 56.9 " 64.0 |
| Northern slope | " 3 " 12 | " 0 " 5 | " 38.5 " 64.5 | " 35.6 " 58.6 |
| Middle slope | " 5 " 15 | " 5 " 9 | " 41.3 " 59.1 | " 45.6 " 59.7 |
| Southern slope | " 3 " 9 | " 2 " 5 | " 61.6 " 63.8 | " 59.9 " 62.9 |
| Southern plateau | " 2 " 21 | " 0 " 7 | " 45.9 " 60.4 | " 52.2 " 56.7 |
| Northern plateau | " 0 " 1 | none | " 33.4 " 43.8 | " 42.2 " 45.1 |
| North Pacific | " 0 " 3 | From 0 " 1 | " 55.0 " 62.2 | " 48.4 " 52.7 |
| Middle Pacific | none | " 0 " 7 | " 33.1 " 90.4 | " 49.1 " 56.3 |
| South Pacific | From 1 " 6 | " 0 " 1 | " 51.0 " 72.8 | " 59.3 " 69.5 |
| Mt. Washington, N. H. | Fourteen | Four | 70.8 | 59.2 |
| Pike's Peak, Col | Nineteen | One | 71.7 | 29.8 |
| Salt Lake City, Utah | Six | Two | 31.7 | 42.1 |

* Relative humidity corrected for altitude.

## COTTON REGION REPORTS.

Temperature and rainfall observations were continued during the month of July, 1883. The averages for the various districts are determined from observations taken at the stations, as shown on chart vi., issued with the REVIEW for April, 1882. For the purpose of comparison, the averages for July, 1883, with the departures, are also given in table below.

It will be seen from this table, that the rainfall for July, 1883, when compared with that of July, 1882, shows large deficiencies in nearly all districts. The means of the maximum temperatures have been higher in all districts, except for the district of Galveston, where there is no change; and the means of the minimum temperatures have also been higher in all districts, except for the district of Little Rock, where it is 1°.5 lower.

*Meteorological Record of the Cotton Districts for the months of July, in 1882 and 1883.*

| Districts. | Rainfall in inches. | | | Temperatures. | | | | | | Extremes for July, 1883. | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Mean of the maxima. | | Change. | Mean of the minima. | | Change. | | |
| | 1882. | 1883. | Deficiency. | 1882. | 1883. | | 1882. | 1883. | | Max. | Min. |
| | | | | ° | ° | ° | ° | ° | ° | ° | ° |
| New Orleans | 8.30 | 3.30 | — 5.00 | 90.4 | 93.2 | + 2.8 | 71.3 | 74.4 | + 3.1 | 104 | 62 |
| Savannah | 6.21 | 3.42 | — 2.79 | 91.0 | 95.7 | + 4.7 | 70.3 | 72.7 | + 2.4 | 107 | 55 |
| Charleston | 7.28 | 4.40 | — 2.88 | 90.9 | 94.6 | + 3.7 | 68.0 | 72.1 | + 4.1 | 104 | 53 |
| Atlanta | 5.45 | 1.24 | — 4.21 | 87.9 | 93.2 | + 5.3 | 67.6 | 69.4 | + 1.8 | 102 | 47 |
| Wilmington | 4.90 | 3.16 | — 2.74 | 90.2 | 93.2 | + 3.0 | 67.7 | 70.2 | + 2.5 | 105 | 60 |
| Memphis | 5.45 | 4.00 | — 1.45 | 88.0 | 91.4 | + 3.1 | 67.1 | 68.3 | + 1.2 | 101 | 57 |
| Galveston | 3.74 | 2.15 | — 1.59 | 94.0 | 94.0 | 0.0 | 71.3 | 73.7 | + 2.4 | 104 | 50 |
| Vicksburg | 10.30 | 3.48 | — 6.82 | 89.4 | 92.2 | + 2.8 | 69.0 | 72.3 | + 3.3 | 99 | 61 |
| Montgomery | 5.18 | 1.65 | — 4.13 | 88.6 | 95.3 | + 6.7 | 67.1 | 69.8 | + 2.7 | 101 | 53 |
| Augusta | 4.93 | 1.94 | — 2.99 | 90.0 | 94.5 | + 4.5 | 69.2 | 72.7 | + 3.5 | 107 | 58 |
| Little Rock | 3.08 | 2.39 | — 0.69 | 89.2 | 94.2 | + 5.0 | 66.0 | 64.9 | — 1.5 | 101 | 49 |
| Mobile | 6.06 | 1.37 | — 4.69 | 90.5 | 97.4 | + 6.9 | 68.7 | 71.0 | + 2.3 | 107 | 59 |

## WINDS.

The prevailing directions of the wind for the month of July, 1883, are shown on chart iii., by arrows flying with the wind. East of the Mississippi river the prevailing winds were, with

but few exceptions, from the southwest; in the southern slope and Missouri valley, they were mostly from the south; in the extreme northwest, northern slope, and on the California coast, they were from the west and northwest; in Oregon, they were from north and northwest.

### HIGH WINDS.

The following wind velocities, of fifty miles or more per hour, have been reported:

On the summit of Mount Washington, New Hampshire, 52 w., 1st; 80 w., 2d; 68 nw., 3d; 76 w., 4th; 60 nw., 5th; 56 nw., 6th; 70 w., 7th; 52 w., 12th; 52 w., 18th; 66 w., 22d; 80 w., 23d; 60 nw., 24th; 52 nw., 28th; 56 nw., 30th; 60 nw., 31st.

Nashville, Tennessee, 61 e., 5th.
Bismarck, Dakota, 56 w., 13th.
Fort Buford, Dakota, 54 w., 13th.
Delaware Breakwater, Delaware, 52 w., 8th.
Fort Assinniboine, Montana, 52 nw., 2d
Portsmouth, North Carolina, 52 w., 25th.

### TOTAL MOVEMENTS OF THE AIR.

[*In miles.*]

In the following table are given the stations reporting the largest and smallest total movements of the air in each of the various districts:

| Districts. | Stations reporting largest. | Miles. | Stations reporting smallest. | Miles. |
|---|---|---|---|---|
| New England | Block Island, R. I. | 9,500 | New London, Conn. | 3,900 |
| Middle Atlantic states | Sandy Hook, N. J. | 9,901 | Lynchburg, Va. | 1,977 |
| South Atlantic states | Hatteras, N. C. | 11,055 | Augusta, Ga. | 2,583 |
| Florida peninsula | Cedar Keys | 6,524 | Sanford | 3,483 |
| East Gulf | Pensacola, Fla. | 5,336 | Montgomery, Ala. | 3,347 |
| West Gulf | Indianola, Tex. | 7,908 | Fort Smith, Ark. | 2,040 |
| Ohio valley | Louisville, Ky. | 5,131 | Indianapolis | 3,294 |
| Tennessee | Nashville | 3,850 | Chattanooga | 3,767 |
| Lower lakes | Buffalo, N. Y. | 7,207 | Oswego, N. Y. | 4,980 |
| Upper lakes | Milwaukee, Wis. | 8,007 | Escanaba, Mich. | 5,354 |
| Extreme northwest | Fort Buford, Dak. | 6,308 | Saint Vincent, Minn. | 4,343 |
| Upper Mississippi valley | Saint Louis, Mo. | 6,831 | Dubuque, Ia. | 3,962 |
| Missouri valley | Huron, Dak. | 6,259 | Omaha, Neb. | 2,448 |
| Northern slope | Fort Assinniboine, Mon. | 8,011 | Deadwood, Dak. | 2,749 |
| Middle slope | Fort Elliott, Tex. | 8,421 | Fort Elliott, Tex. | 4,664 |
| Southern slope | Fort Stockton, Tex. | 8,352 | Fort Concho, Texas | 6,929 |
| Southern plateau | Fort Grant, Ariz. | 4,756 | El Paso, Tex | 3,356 |
| Northern plateau | Dayton, Wash. | 4,537 | Lewiston, Idaho | 2,077 |
| North Pacific | Portland, Oregon | 3,447 | Olympia, Wash | 726 |
| * Middle Pacific | San Francisco, Cal. | 9,158 | Red Bluff, Cal. | 3,902 |
| South Pacific | Yuma, Arizona | 5,028 | Los Angeles, Cal. | 4,662 |

* No record at Cape Mendocino, Cal

On the summit of Mount Washington, New Hampshire, the total movement of the air for the month was 22,380 miles.

### LOCAL STORMS.

*Arkansas.*—Eureka Springs, Carroll county: a very heavy rain storm occurred at this place on the 14th, seriously damaging the growing crops. Several houses and barns were blown down, and many others were damaged to a more or less extent.

*Connecticut.*—New Haven: a violent squall of wind and rain passed over this station at 5.40 p. m., of the 2d, doing considerable damage in the suburbs of the city. The storm was accompanied by hail, which destroyed a large quantity of window-glass.

New London, 2d: a storm of unusual severity occurred at this place on the evening of the 2d. The most violent part of the storm was of about five minutes duration, during which time many trees in this city, which have withstood the storms of a century, were uprooted, and the streets were blockaded with debris. Several barns in the suburbs of the city were blown down. Reports from Waterbury, Norwich, Middletown, and Niantic indicate that the course of this storm was about forty-five miles in length, with an average width of from six to eight miles.

Hartford: the storm of the afternoon of the 2d passed south of this city, doing much damage to towns along the river and sound.

Waterbury: the severest storm that has visited this place for several years occurred on the afternoon of the 2d. Several large trees were uprooted and the streets were strewn with broken branches. Many windows were broken by the hail.

*Dakota.*—Aurora, Brookings county: a heavy hail and wind storm visited the northeastern part of this county on the night of the 12–13th. The corn and grain fields were badly damaged by hail. The storm pursued a southeasterly course, crossing the state line near Lake Benton, Minnesota.

Huron: a severe storm occurred on the 13th at points about fifteen miles south and southwest of here. Small houses, barns, &c., were destroyed. On the 18th a destructive storm occurred, which in some places was accompanied by large hail; much damage was done by lightning during the storm.

Bismarck: at 6 p. m. of the 13th a very severe wind storm occurred, which continued for about one hour and thirty minutes; the wind reached a velocity of sixty miles per hour.

Fort Yates: a violent wind storm occurred at this place on the evening of the 13th, causing slight damage.

*Florida.*—Jacksonville, 8th: a heavy thunder storm occurred on this date, during which considerable damage was caused by lightning.

Saint Augustine: a violent northeasterly storm occurred on the 18th, damaging fencing, trees, &c.

*Illinois.*—Joliet, Will county: the wind and rain storm which passed over this vicinity on the afternoon of the 7th was one of the most destructive storms ever known here. Many barns, dwellings, and fences in this county were blown down, and large numbers of trees were prostrated. On the evening of the 23d this place was visited by a violent thunder storm, during which several buildings were struck by lightning.

Clinton, De Witt county: a severe storm of wind and hail visited this place during the night of the 12–13th. Reports from the western part of De Witt and Logan counties state the corn crop was badly damaged by hail.

Geneseo, Henry county: during the night of the 12–13th, a heavy storm of wind and rain passed through Loraine township. Several barns were blown down, and outbuildings, corn-cribs, &c., were demolished. Many fields of corn and grain within the path of the storm, which was about four miles wide, were completely destroyed. The damage sustained by the farmers is estimated at from $25,000 to $35,000.

Atlanta, Logan county: a very heavy rain and hail storm occurred on the night of the 12–13th, which did great damage to the growing crops in this locality.

Avon, Fulton county: the hail storm of the night of the 12–13th completely ruined the crops northeast of this place. The path of the storm was about two miles in width and about five miles in length.

Rock Island, Rock Island county: the town of Cordova in this county was visited by a violent wind and rain storm on the night of the 12–13th. The crops in that vicinity were badly damaged, and many buildings were unroofed.

Gibson City, Ford county: at 10 p. m., of the 12th, this place was visited by a violent storm, which blew down the upper walls of the new opera house, and caused other damage, entailing a loss of $5,000.

Carlinsville, Macoupin county, 13th: a heavy storm of wind and rain passed over this section this afternoon, causing a large amount of damage to the growing crops and to other property.

Peoria: buildings and trees in this locality were damaged to the extent of from $3,000 to $4,000 by the storm of the afternoon of the 13th. Several persons were injured.

Belleville, Saint Clair county: a number of houses were more or less seriously injured at this place during the storm of the 13th.

Alton, Madison county, 13th: during the storm of this date three churches were partly unroofed, other buildings injured, and the streets strewn with fallen trees.

East Saint Louis, Saint Clair county: the storm of the evening of the 13th caused considerable damage by blowing down trees, chimneys, &c. A train of twenty-five cars was blown from the track while opposite the Chicago and Alton depot, and nearly all of them were completely or partly wrecked. In

surrounding localities much damage was done to fences, barns, and other outbuildings.

Olney, Richland county: at 8.30 p. m., of the 13th, a severe wind and rain storm passed over this city. Several buildings were injured, and hundreds of shade trees were blown down.

Carmi, White county: a tornado struck the southern part of this city at 8.30 p. m., of the 13th, and destroyed a few small buildings.

Sumner, Lawrence county: one of the severest storms that has ever visited this locality occurred at 8.30 p. m., of the 13th. The Sumner Milling company's flouring mill was unroofed, and a large amount of damage was done to the machinery by the heavy rain. Numerous other buildings were damaged to a greater or less extent.

Mitchell, Madison county: a heavy storm of wind and rain passed over this place on the evening of the 13th. Outbuildings were destroyed, orchards stripped of fruit, and the wheat shocks scattered.

Roodhouse, Greene county: a destructive wind storm occurred at this place on the evening of the 13th. The damage to buildings, fences, and other property in this community is estimated at from $15,000 to $20,000.

White Hall, Greene county; between 5 and 6 p. m., of the 13th, a severe storm visited this place, which blew the roofs from buildings and caused other damage. In McDonough and Schuyler counties, the hail accompanying the storm was very large, and ruined the corn and grain crops in many localities.

*Indiana.*—Logansport, Cass county: telegraph lines, trees, &c., were prostrated in this locality by the storm of the night of the 4–5th.

La Fayette, Tippecanoe county: the wind and hail storm of the night of the 12–13th injured the corn and oat crops to a to a considerable extent in this county.

Indianapolis: the damage caused by the storm which visited this vicinity on the night of the 12–13th is estimated at $50,000. South and west of this city the fields of growing corn were torn into shreds, and large tracts of trees were uprooted.

Vincennes, Knox county: the storm of the 13th proved very destructive in this county. Many promising fields of corn were entirely ruined, shocked grain and buildings were badly damaged, and stock killed.

Elkhart, Elkhart county: a violent storm visited this region during the afternoon of the 14th, uprooting trees, blowing down fences, and doing great damage to crops.

*Iowa.*—Burlington: a heavy wind storm, causing damage to trees and buildings, occurred at this place on the 5th.

Austin, Dickinson county: a heavy wind storm struck this place on the afternoon of the 11th, but caused no damage other than the blowing down of a few trees and outbuildings in the western part of the city. Reports from points northwest of this place state that considerable damage was done by the hail accompanying the storm.

Belle Plaine, Benton county: the severest storm of the season passed over this place at about 8.30 p. m. of the 11th. The track of the storm was about one-half mile wide, passing from west to east. The grain in the track of the storm was so badly damaged as to be not worth harvesting.

Council Bluffs: special dispatches from McPaul, Plum Hollow, Percival, and Hamburg, on the Kansas Central railroad, in Fremont county, state that a very violent storm of rain and hail visited those places about noon of the 12th. Wheat, corn, and grass crops were levelled to the ground and cut to pieces by the hail. The depot of the Kansas Pacific railway at McPaul was almost completely wrecked, and all of the windows of the town were broken. At Percival and Plum Hollow great damage was done by the wind and hail.

Waterloo, Black Hawk county: a severe storm passed over a part of this county during the evening of the 12th. At this place the storm was not particularly severe, but at points east and northeast, great damage was done to the growing crops. It is estimated that more than 1,000 acres of cereals in this county are damaged to such an extent as not to be worth harvesting. Very large hail accompanied the storm, breaking windows and causing other damage. The storm extended to Jesup and Independence, and was about five miles in width.

Clinton, Clinton county: a very destructive hail and rain storm visited Clinton and Scott counties between 8 and 9 p. m. of the 12th, causing a large amount of damage to the growing crops, small buildings, fences, and trees. At Princetown, Scott county, about two hundred large trees were blown down. Hailstones of unusual size fell, covering the ground in places to considerable depths. The track of the storm, as near as can be ascertained, began north of Grand Mound, Clinton county, and followed the course of Wapsipinicon river, in an irregular southeasterly direction, to Princeton, on the Mississippi river. The width of the storm at Grand Mound was about four miles, and in Scott county it was about six miles.

Keokuk: the storm of the 13th raged with great violence southwest of this place. A train on the Chicago and Kansas City railroad was blown from the track near Browning, Missouri.

Des Moines: a severe storm prevailed at this place from 2 to 3.30 p. m. of the 16th; several houses were unroofed, and great injury was done to the crops in this vicinity. The wind reached a velocity of forty miles an hour. Reports from Audubon, Dallas, Jasper, and Marshall counties state that the storm was of great severity in those counties, and that much damage resulted from it.

Dubuque: during the night of the 22–23d this part of the state was visited by a severe wind and rain storm. Farmers reported heavy losses, many grain fields having been entirely destroyed by the wind and hail. Much damage has resulted from washouts on the Chicago, Milwaukee, and Saint Paul railroad.

*Kansas.*—Dodge City: a tornado occurred at Cimarron, a station on the Topeka and Santa Fé railroad, eighteen miles west of this place, at 4 p. m., of the 11th, wrecking a number of buildings.

Topeka: an unusually severe storm occurred at this place during the night of the 10–11th. The rainfall was very heavy, and caused much damage in the lower parts of of the city. The Atchison, Topeka, and Santa Fé railroad track and yard were submerged, several houses were flooded, small buildings were moved from their foundations and the sidewalks were badly damaged.

Holton, Jackson county: during the night of the 10–11th, Soldier City, a town of about two hundred inhabitants, sixteen miles west of this place, was almost completely destroyed by a tornado. Four persons were killed and about fifteen were severely injured. The storm passed from north to south.

Atchison, Atchison county: the storm of the 13th proved very destructive in the northern part of this state, and in the southern counties of Kansas. In the river, at this place, a raft containing more than 400,000 feet of logs was torn from its moorings and the logs scattered. In Doniphan county dwellings and barns were unroofed, and corn-cribs and fences blown down. Near Iowa Point, in Doniphan county, a church and several houses were destroyed. At Pomeroy, Wyandotte county, a saw-mill was blown down and the machinery ruined.

Newton, Harvey county: about 4 p. m., of the 13th, a violent storm passed over Wakarusa township, about three miles south of this city, destroying the wheat fields and damaging other property.

Marysville, Marshall county: this place was visited by a tornado between 12 m. and 1 p. m. of the 13th. Thirteen of the most important business houses were unroofed, and the court house and jail were badly damaged. The city hall and a church were almost completely wrecked.

Wellington, Sumner county: at 5 p. m., of the 16th, a tornado of small extent occurred in Guelph township. A cone-shaped cloud, with an apparent diameter of seventy-five feet, descended from a heavy rain cloud, and striking the earth pursued a zigzag southerly course, destroying two houses and

causing other damage. At one place in the path of the tornado the earth was scooped out to a depth of three feet.

*Kentucky.*—Louisville: a heavy rain and wind storm occurred here on the afternoon of the 16th. The streets were flooded and rendered impassable. Several roofs were blown off, and many trees and signs were blown down. More than 2.00 inches of rain fell during the storm.

*Massachusetts.*—Williamstown: a violent storm swept through the Williamstown valley on the afternoon of the 6th, damaging the new college gymnasium to the extent of $6,000. Many barns and trees were blown down.

*Michigan.*—Port Huron, 2d: on this date the schooner "S. L. Watson" was caught in a squall and dismantled, while six miles south of this place.

Cadillac, Wexford county: a violent rain and hail storm occurred here on the afternoon of the 16th, causing damage to buildings, fences, &c.

Eaton Rapids, Eaton county: at noon, of the 24th, a dwelling about five miles southeast of this place was destroyed by a tornado, and three of the inmates were killed.

Mason, Ingham county: a violent tornado swept over the southwestern part of this county on the 24th, striking the village of Onondaga, and demolishing several houses. A large amount of damage was done to fences and timber throughout the county.

*Minnesota.*—Graceville, Big Stone county: a number of buildings were destroyed in this vicinity by the storm of the 2d.

Belle Plaine, Scott county: the severest rain and hail storm of this season passed over this place at 8.30 p. m. of the 11th. The storm was of short duration, and caused much damage to buildings and crops. The course of the storm was from west to east, and its track was about one-half mile wide.

Lake Benton, Lincoln county: a heavy hail storm occurred at this place on the 12th. The course of the storm was from northwest to southeast; its path was one mile in width and six miles long. At Volga about three hundred windows were broken. Much damage was done to the crops.

Shakopee, Scott county: a heavy rain and thunder storm occurred at this place about 12.30 a. m of the 20th. The storm passed from northwest to southeast, doing much damage to shade trees and crops.

Winona, Winona county: between midnight and 1 a. m., of the 20th, a violent thunder-storm from the southwest passed over this city. Along the river road, from Winona to Saint Paul, the storm was very severe. East of Winona the rainfall was very heavy and washouts occurred on the railroads near Salem. The storm extended westward to Dakota, and at some points it was accompanied by hail. Near Faxon, Sibley county, the storm was one of the severest ever experienced in that locality and hundreds of acres of crops were totally destroyed.

Northfield: a violent storm passed over the southern part of this state on the 21st. At this station, for about five minutes, the anemometer showed a wind velocity of seventy-two miles per hour.

Waseca, Waseca county: the tornado of the 21st struck this place at about 11 a. m., coming from a southwesterly direction. A large number of buildings were wrecked, and many trees were uprooted. The damage is estimated at $10,000.

Kasson, Dodge county: at about 11.30 a. m., of the 21st, this section was visited by a violent tornado. A number of dwellings were destroyed and four persons killed.

Mantorville, Dodge county: during the storm of the 21st the court house at this place was unroofed, and numerous buildings at different points in the county were destroyed or damaged, and about twenty persons were injured.

Rochester, Olmsted county: a large amount of damage was done to buildings and crops at various points in this county by the storm of the 21st.

Lake City, Wabasha county: the commissioners of this county estimate the damage by the storm of the 21st to the bridges in this county at $50,000. Numerous buildings were blown down or injured, and a large amount of damage was done to crops.

Elgin, Wabasha county: a tornado passed over this place at about 12 m. of the 21st, destroying more than $50,000 worth of property. But few buildings in the town escaped without injury. Two persons were killed.

Wabasha, Wabasha county: the rainfall during the storm of the 21st was the heaviest that has been known at this place for many years. Many bridges on the railroads in this county were washed out, and the railroad tracks were also badly washed. The crops were damaged to a considerable extent by the hail which accompanied the storm.

Bird Island, Renville county: a heavy thunder storm accompanied by high wind passed over the southern part of this county during the morning of the 21st. The storm was accompanied by hail from the town of Camp to Fort Ridgely, Nicolette county.

Red Wing, Goodhue county: the storm of the 21st did great damage to the crops in this locality.

*Missouri.*—Saint Louis: at about 6 p. m., of the 13th, a heavy wind and rain storm occurred, causing much damage to property, both on the river and in this city. Two lumber rafts with 1,400,000 feet of lumber were driven from moorings down the river. The Missouri Pacific freight house and the asylum for the blind were unroofed, and many chimneys, signs, etc., throughout the city were blown down. The agricultural interests in Saint Louis county suffered seriously. Great damage was done to orchards and buildings. Trains were delayed in consequence of the debris which was strewn along the railroad tracks.

Wellsville, Montgomery county: at 4 p. m., of the 13th, this place was visited by a severe wind and rain storm, during which the public school building was blown down, entailing a loss of $4,000.

New Hampton, Harrison county: fourteen buildings were destroyed at this place by the storm of the 13th. The fruit crop in this locality was badly damaged.

Webb City, Jasper county: the storm of the 13th resulted in damage estimated at more than $50,000 in this county. The rainfall was very heavy, and caused the creeks and streams to rise suddenly and flood the lands adjacent to them. The lead and zinc mines between this place and Carterville were filled with water, necessitating the suspension of work for about one month, and throwing about one thousand men out of employment. At Joplin the rainfall is reported to have been the heaviest that has occurred since 1875. Willow creek, which runs through the southern part of this place, rose rapidly, flooding the houses along its banks and compelling families to abandon their homes. At Carthage, Jasper county, all of the valleys and lowlands were inundated.

Trenton, Grundy county: this place was visited by a violent wind storm at 2 p. m. of the 13th, which caused considerable damage. Many small buildings, fences, and trees in various parts of the city were blown down. The old First church was completely wrecked, and a school building was badly damaged. A part of the roof of the Chicago, Rock Island, and Pacific freight house was blown off. The losses in this vicinity are estimated at from $20,000 to $30,000.

Maldin, Dunklin county: a church, schoolhouse, the Masonic hall, and an unfinished hotel at this place were blown down during the storm of the 13th, entailing a loss of $10,000.

Roseberry, Nodaway county: a heavy wind and hail storm passed over this locality at 1.30 p. m. of the 13th. At Wilcox, a small village in this county, nearly all of the buildings were injured.

Jefferson City: a part of the penitentiary building at this place was unroofed, and a number of chimneys blown down during the storm of the 13th. In the vicinity of Wyandotte, Kansas, much damage was done to orchards and fences.

Louisiana, Pike county: the most destructive storm that has visited this region for twenty years occurred here on the afternoon of the 13th. A large number of buildings were damaged, and the fishermen on the river lost their boats, fishing nets, &c. The injury to crops and orchards in this locality is very great.

Ashburn, a small village in this county, was almost entirely destroyed.

Sedalia: a severe storm visited this locality during the night of the 12th and 13th. In this city signs and trees were torn down and many windows were broken by hailstones.

New Cambria, Macon county: a severe wind and rain storm visited this section on the afternoon of the 13th, blowing down outhouses and sheds. The storm came from the northwest, and began about 3.15 p. m., lasting forty-five minutes. Trees and crops were seriously damaged.

Linneus, Linn county: the storm of the 13th did great damage to crops and buildings in this vicinity. A passenger train on a branch of the Chicago, Burlington, and Quincy railroad was lifted from the track and all of the cars were capsized. Twenty-one of the twenty-seven passengers were injured.

Saint Joseph: on the afternoon of the 13th a violent storm passed over this region. The first town in the track of the storm was Hamburg, Fremont county, Iowa, which was struck about 12m. The storm next visited Westboro', Atchison county, Missouri, where nearly all the buildings in the town were injured, and about ten were completely demolished. The storm reached Stanberry, Gentry county, about 1 p. m., where numerous buildings were blown down or otherwise injured. It is reported that at Burlington Junction, Nodaway county, not a building escaped injury. Main street was filled with the wrecks of buildings.

Carthage, Jasper county: this place was visited by a severe storm on the night of the 16–17th. Numerous buildings were struck by lightning and burned. Severe storms also occurred at Marshall, Saline county, and Warrensburg, Johnson county.

Chillicothe, Livingston county: a heavy thunder-storm prevailed at this place from 11 p. m. of the 18th to 3 a. m. of the 19th. On the western horizon a dark cloud came up, from which there were continuous flashes of lightning. The cloud rose higher and higher, and was suddenly torn to small fragments with terrible detonation. The sound and the concussion were so violent that many buildings trembled as though shaken by an earthquake. Pictures fell from the walls and glassware in the sideboards was broken. During the storm many persons sought shelter in their cellars. Two barns were struck by lightning, set on fire and entirely consumed.

*Nebraska.*—Lincoln, Lancaster county: one of the severest storms of the season occurred at this place on the 13th. Several large brick houses in course of construction were levelled to the ground. At Louisville, Cass county, the crops were badly damaged by hail.

*New Hampshire.*—New Market, Rockingham county: violent thunder storms occurred at this place on the 4th and 5th, causing damage to buildings, orchards, etc. The lightning struck several buildings and killed one person. The storms of these dates are considered the severest that have visited this place for many years.

*New Jersey.*—Ocean Beach, Monmouth county: a severe storm of wind and hail visited this place during the night of the 12–13th, destroying a large barn and unroofing several houses.

Ashbury Park, Monmouth county: a very severe storm occurred at this place on the afternoon of the 23d. The wind blew with great force more than one hour, unroofing buildings and doing other damage.

*New York.*—Binghampton, Broome county: a violent storm of wind and rain visited this section on the afternoon of the 2d. Many large trees were uprooted and houses were unroofed or blown down.

Factoryville, Tioga county: between 3 and 4 p. m., of the 2d, a violent storm from the northwest passed over this region. Trees were uprooted, barns blown down, and roofs and fences carried away.

Buffalo: on the morning of the 3d a violent squall occurred during the passage over this city of a dark "V" shaped cloud. Although the cloud passed almost directly over the office building, the anemometer self-register did not show a greater velocity than thirty miles per hour for about two minutes. Two freight cars on the New York Central railroad were blown over, a few windows were broken, and other slight damages caused.

Albany: a violent thunder storm occurred on the 4th, causing damage between this place and Castleton. A heavy rain and hail storm visited the country about eight miles south of this place on the 5th. Trees and buildings were blown down and the crops much injured. The barge "Julia Lumbard" broke from her moorings at Castleton, and sustained damage; and the steamer "Eagle," narrowly escaped capsizing.

*North Carolina.*—Kittyhawk: on the 10th, near Life Saving station, No. 10, a tornado prostrated nearly two miles of telegraph line. Some small buildings were blown down, and two large surf-boats were blown into the sea and lost.

Charlotte: reports from Greensboro', Guilford county, state that that place was visited by a violent storm on the evening of the 24th, which unroofed houses, and caused other damage to the town. At points south of Charlotte, in South Carolina, the storm raged with great violence.

*Pennsylvania.*—Wellsboro', Tioga county: during the evening of the 2d this county was visited by a destructive storm, during which the wind reached an estimated velocity of sixty miles per hour; many trees, fences, and small buildings in various parts of the county were blown down. Very heavy rain fell during the storm. Washouts occurred on the railroads, and bridges were washed away.

Wilkinsburg, Allegheny county: this place was visited by a severe storm on the afternoon of the 6th. Damage to the extent of several thousand dollars was done in this vicinity.

Kittanning, Armstrong county: during the afternoon of the 6th, a violent rain, and thunder storm passed over this place. Lightning struck numerous objects in the vicinity, causing much damage.

Reading: the storm of the night of the 13–14th was unusally severe. Fences were levelled and trees uprooted and stripped of fruit. In the lower part of this (Berks) county the storm was accompanied by hail.

Freeport, Armstrong county: this locality was visited by a severe storm of rain and hail on the 13th. A large quantity of hail fell, the hailstones being about the size of hickory-nuts. The storm was much severer at points west and south of this place, in Allegheny and Westmoreland counties, where the grain crops and orchards were seriously damaged.

Grampain Hills, Clearfield county: a heavy storm of rain and hail passed over this place on the evening of the 23d. The storm caused no damage at this station, but at points a few miles southwest buildings were unroofed and much valuable timber was blown down.

Leetsdale, Allegheny county: a severe storm occurred in this locality on the evening of the 23d, causing damage estimated at more than $3,000. Many trees were broken down or twisted off, and several windows were broken by hail. A pier of the Pittsburg and Lake Erie railroad bridge near this place was washed away, delaying trains for three days.

*South Carolina.*—Wedgefield, Sumter county: during the afternoon of the 7th a severe storm occurred, which partly unroofed the depot of the Wilmington, Columbia, and Augusta railroad.

*Tennessee.*—Nashville: a heavy thunder storm occurred between 3.45 and 5.12 p. m. of the 5th, during which a maximum wind velocity of sixty-one miles was recorded. Trees, signs, &c., in and about the city were blown down.

Memphis: a violent thunder storm occurred between 8 and 9 p. m. of the 24th. For five minutes the wind blew at the rate of sixty miles per hour. The roofs of some buildings were blown off, and many telegraph poles and trees were prostrated. Near this city a box car was blown from the railroad track. The track of the Memphis and Little Rock railroad was obstructed by fallen tress, causing delay of trains. Some slight damage was done to crops and the river property.

*Texas.*—Fort Worth, Tarrant county: a destructive storm of wind and hail occurred at this place at about 3 p. m. of the

25th. The storm continued for more than one hour, blowing down a number of houses and trees.

*Virginia.*—Chincoteague: a severe gale occurred on the 24th, the wind reaching a velocity of forty-six miles per hour. A number of telegraph poles and one building were blown down at this place, and two sloops were capsized.

Petersburg: the counties adjacent to this place were visited by a violent storm during the night of the 5–6th. A number of buildings and other objects were struck by lightning, and orchard trees and telegraph poles were prostrated.

*Wisconsin.*—Milwaukee, 2d: a severe storm passed over Ozaukee county on the morning of this date, demolishing buildings at numerous points throughout the country. At Oakfield, the damage is estimated at $15,000. At Necadah, a bridge over the Wisconsin river was damaged to the extent of $4,000. The width of the storm was about two and one-half miles.

Eau Claire, Eau Claire county: a storm of considerable severity passed over this region during the night of the 12-13th, destroying much farm property at points south and west of this place.

Oconomwoc, Waukesha county: a violent wind and rain storm swept over this section on the afternoon of the 16th. No damage was done in the immediate vicinity of this place, but a violent tornado swept over the county about eight miles south, levelling everything within its path, which was about one-fourth of a mile in width.

Madison: the rain and hail storm of the 16th resulted in serious damage to the crops in localities adjacent to this place. At Syene, Lake View, and Oregon, the fields of corn were stripped and other grain was beaten into the ground by the hail. The damage to crops in Fitchburg township alone is considered to be from $8,000 to $10,000. In Madison the shade trees were injured and windows broken, but the damage was comparatively slight.

Fort Atkinson, Jefferson county: At 1.30 p. m., of the 16th, this place was visited by a violent tornado, which struck the town on the south side of the river, and passing eastward, destroyed a number of buildings; several persons were seriously injured. The losses are estimated at $50,000.

Milwaukee: the storm of the 16th was very severe in this locality, and caused serious damage to various kinds of property. Numerous objects in and about the city were struck by lightning and more or less seriously injured.

Sussex, Waukesha county: on the 16th the town of Ottawa, about sixteen miles southwest of here, was visited by a storm of great severity. Large trees were twisted off and other damage done.

La Crosse: between 2.30 and 5 p. m., of the 20th, this place was visited by a most violent thunder storm. Two barns and one house were struck by lightning and burned; more than 2.50 inches of rain fell during the storm. Trains were delayed from six to eight hours on account of washouts. The storm was accompanied by hail as large as walnuts. A large amount of damage was done to crops in some localities.

Appleton, Outagamie county: the storm of the 21st did damage to the extent of $200,000 in this city and surrounding localities. This storm was considered the severest that has ever visited this section. The rainfall was very heavy, and resulted in washing out nearly all the culverts in the city. At 3 p. m., of the 22d, a break occurred in the government canal at Kankanna, and more than one hundred and seventy-five feet of the embankment were washed away.

Mineral Point, Iowa county: at 1.30 a. m., of the 21st, a violent storm struck the village of Cobb, in this county, demolishing several buildings and causing loss of life. After leaving Cobb, the storm pressed eastward toward Dodgeville, where buildings were blown down and otherwise damaged.

Milwaukee: a heavy storm of wind and rain occurred on the 20th, during which the wind reached a velocity of forty-six miles from the southwest. The scow "Sea Bird," laden with lumber, was capsized.

Neillsville, Clark county: a severe storm occurred between 12.30 and 1.30 p. m., of the 21st, accompanied by very heavy rain. Streams rose rapidly, washing away several bridges in this vicinity.

Port Edwards, Wood county: the losses caused by the storm of the 21st at this place are estimated at from $15,000 to $20,000. Two persons were killed.

## NAVIGATION.

### STAGE OF WATER IN RIVERS.

The Mississippi river was highest at Saint Paul, Minnesota; Saint Louis, Missouri; and Cairo, Illinois, on the 1st; the month of June having closed with the water above the danger line at Saint Louis. It was highest and stationary at Memphis, Tennessee, on the 1st, 2d, and 3d; at Vicksburg, Mississippi, from the 6th to 12th; and at New Orleans, Louisiana, from the 9th to 15th. Between La Crosse, Wisconsin, and Keokuk, Iowa, the river was highest from the 26th to 31st; and lowest from the 13th to 22d.

The Missouri river was highest at Leavenworth, Kansas, on the 1st; at Omaha, Nebraska, on the 8th; and at Yankton, Dakota, on the 9th. At Omaha it was within ten inches of the danger line, when at its highest point on the 8th. The lowest stages were observed from the 28th to the 31st.

The Ohio river remained low throughout the month.

The observer at Augusta, Georgia, reports that on the 26th navigation was suspended in the Savannah river at all places above a point about seventy-five miles south of Augusta.

Navigation in the Cumberland river, at Nashville, Tennessee, was suspended on the 14th on account of the low stage of water.

The highest and lowest stages of water observed at the Signal-Service stations during July, 1883, are shown in the following table:

*Heights of rivers above low-water mark, July, 1883.*

| Stations. | Danger-point on gauge. | Highest water. | | Lowest water. | |
|---|---|---|---|---|---|
| | | Date. | Height. | Date. | Height. |
| | Ft. In. | | Ft. In. | | Ft. In. |
| *Red River:* | | | | | |
| Shreveport, La | 29 9 | 1 | 18 10 | 31 | 8 5 |
| *Arkansas:* | | | | | |
| Little Rock, Ark‡ | 30 0 | 2 | 5 11 | 15, 16, 17 | 2 6 |
| Fort Smith, Ark | ..... | 13 | 9 2 | 13 | *— 1 7 |
| *Missouri:* | | | | | |
| Yankton, Dakota | 20 0 | 9 | 10 2 | 28 to 31 | 3 8 |
| Omaha, Nebr | 16 0 | 8 | 15 2 | 31 | 9 4 |
| Leavenworth, Kans | 21 0 | 1 | 19 8 | 31 | 11 11 |
| *Mississippi:* | | | | | |
| Saint Paul, Minn | 14 6 | 1 | 5 4 | 31 | 3 7 |
| La Crosse, Wis | 18 0 | 26 | 6 10 | 19 | 4 6 |
| Dubuque, Iowa | 21 10 | 27 | 12 6 | 13, 14 | 7 9 |
| Davenport, Iowa | 15 0 | 29, 30 | 9 11 | 14, 15, 16 | 5 8 |
| Keokuk, Iowa | 14 6 | 31 | 10 5 | 20, 21, 22 | 7 3 |
| Saint Louis, Mo | 30 0 | 1 | 32 1 | 29, 30 | 18 0 |
| Cairo, Ill | 40 0 | 1 | 38 9 | 31 | 19 5 |
| Memphis, Tenn | 34 0 | 1, 2, 3 | 31 2 | 31 | 15 7 |
| Vicksburg, Miss | 41 0 | 6 to 12 | 36 7 | 31 | 31 5 |
| New Orleans, La† | —2 6 | 9 to 15 | 7 2 | 31 | — 3 9 |
| *Ohio:* | | | | | |
| Pittsburg, Pa | 20 0 | 29 | 10 11 | 23 | 2 9 |
| Cincinnati, Ohio | 50 0 | 15 | 15 11 | 28 | 9 3 |
| Louisville, Ky | 24 0 | 1 | 8 1 | 30 | 5 8 |
| *Cumberland:* | | | | | |
| Nashville, Tenn | 42 0 | 18 | 8 9 | 30 | 2 4 |
| *Tennessee:* | | | | | |
| Chattanooga, Tenn | 33 0 | 1 | 4 1 | 31 | 1 5 |
| *Monongahela:* | | | | | |
| Pittsburg, Pa | 29 0 | 29 | 10 11 | 23 | 2 9 |
| *Savannah:* | | | | | |
| Augusta, Ga | 30 0 | 1 | 6 0 | 22 | 4 5 |
| *Willamette:* | | | | | |
| Portland, Oreg | ..... | 3 | 17 5 | 31 | 7 5 |
| *Sacramento:* | | | | | |
| Red Bluff, Cal | ..... | 1, 2 | 1 0 | 27 to 31 | 0 7 |
| Sacramento, Cal | ..... | 1, 2 | 10 10 | 29, 30, 31 | 7 9 |
| *Mobile:* | | | | | |
| Mobile, Ala | ..... | 4 | 17 9 | 26 | 15 3 |
| *Colorado:* | | | | | |
| Yuma, Arizona | ..... | 3 | 24 4 | 31 | 18 0 |

*Below bench-mark. ‡Observations from 1st to 19th only. †Below high-water marks of 1874 and 1883.

### FLOODS.

Saint Thomas, Ontario, 5th.—Owing to the recent heavy rains, the creeks in this vicinity overflowed their banks, carrying away fences and bridges, and flooding lowlands. A washout

occurred on the Port Stanley branch of the Grand Trunk railroad, causing delay of trains.

Galena, Jo Daviess county, Illinois.—A heavy rain storm occurred in this vicinity during the 4th and 5th. Several bridges were washed away, and the roads between this place and Sinsinawa Mound, were ruined in many places. The crops suffered great damage.

Cairo, Illinois.—Some of the farms near the Mississippi river, in this vicinity, that were overflowed by the June rise, remained under water until about the 10th of July. Farms located near the Mississippi, in the northern part of this (Alexander) county, that are seldom overflowed, sustained damage to crops estimated at $10,000, by this overflow.

Ionia, Ionia county, Michigan.—Great damage was caused by floods along Grand river on the 5th; hundreds of acres of corn and grain were destroyed. A second overflow, causing additional damage, occurred on the 22d.

London, Ontario.—A very heavy rain storm prevailed at this place from 6 p. m. of the 10th until 3 a. m. of the 11th. The Thames river overflowed its banks and flooded the entire western suburbs of the city, compelling about 2,000 persons to leave their homes. All of the bridges across the river were destroyed. The area of the storm did not exceed twenty miles. About twenty persons were drowned, and property valued at $500,000 was destroyed. (See extract from "Canadian Weather Review" relative to this storm, under "notes and extracts.")

Harrisonburg, Rockingham county, Virginia.—A destructive freshet occurred at this place during the evening of the 12th. Black's run, a small stream running through this place, overflowed its banks and flooded a number of dwellings. Shocks of wheat from the neighboring fields, fences, small buildings, and other property were carried away.

Springfield, Windsor county, Vermont.—The heavy rains in this vicinity on the 12th caused damage estimated at $50,000. Buildings, bridges, and other property were washed away.

Exeter, Barry county, Missouri.—The heavy rain storm of the 14th caused a large amount of damage in this and the adjoining counties. The streams rose to greater heights than during the floods of 1844.

Easton, Pennsylvania.—The roads throughout Northampton county were badly washed by the heavy rains of the 15th. The track of the Lehigh valley railroad, between this place and Bethlehem, was blockaded by land-slides, and the Eastern and Amboy railroad was covered with two feet of water between Petersburg and Philipsburg.

Lansing, Michigan.—More than four inches of rain fell at this place during the storm of the 21st and 22d, which is the heaviest precipitation ever recorded here. Much damage was done in this city by flooding cellars and basements. The hay and grain crops in this locality were also injured.

The following communication relating to this storm has been received from Dr. Henry S. Baker, Secretary of the Michigan State Board of Health, and Director of the Michigan Weather Service:

Gen. W. B. Hazen, Chief Signal Officer of the Army, Washington, D. C.

DEAR SIR: Since writing you relative to the storm of Saturday, July 21, I have secured information concerning a "tidal wave," which seems connected with that storm, and of which the particulars are somewhat as follows:

About 6 o'clock on Saturday, July 21, gentlemen were standing on the beach at a summer resort called Harbor Point, at the point which runs out into Little Traverse Bay, their conversation being relative to the high water of this year. They were looking at a stump which they knew the year before was entirely above water, when the water began to recede, and according to some of the gentlemen present, it receded about twenty feet down the beach. In about a minute and one-half, some think it may have been five, or even ten minutes, it began to rise again and was soon four feet higher than ever known before. This movement of the water was attended by no disturbance of the water, nothing like a wave or billow. My theory is that the water was pushed ahead of the storm, and that this wave was from that storm and extended into the bay, and that the locality was north of the northern edge of the storm, as it sprinkled a little some time before the wave.

Very respectfully,

HENRY B. BAKER, *Secretary.*

Fond du Lac, Fond du Lac county, Wisconsin, 21–23d.—The recent heavy rains have overflowed the streams and ravines in this vicinity. Several streets in this city were covered with water, causing a large amount of damage to various kinds of property. About three hundred feet of the road-bed of the Fond du Lac, Amboy, and Peoria railroad were washed away, near Theresa, in Dodge county. The whole country between this place and Milwaukee was covered with water, and the crops were nearly ruined.

Milwaukee, Wisconsin.—On the 23d the Milwaukee river rose to a height more than four feet above the danger-line, floating away lumber and flooding many stores. Washouts occurred on the various railroads in this state.

Manitowoc, Manitowoc county, Wisconsin.—The heavy rains of the 21st and 22d caused the river at this place to rise to a greater height than has ever been known. Three mill dams and several saw mills have been carried away. Crops were severely injured by the excessive rains.

Salt Lake City, Utah.—During the afternoon of the 29th a destructive flood occurred in the Kanab cañon, in southern Utah. All of the wheat in the upper settlements was washed away, and a number of cattle were drowned. Many wagons and agricultural implements were lost.

### LOW TIDES.

Indianola, Texas, 10th, 11th, 17th, 18th, 19th, 25th to 29th.

## TEMPERATURE OF WATER.

The temperature of water as observed in rivers and harbors at the Signal Service stations, during July, 1883, with the average depth at which the observations were made, are given in the table below. Monthly ranges exceeding 14° occurred as follows: Duluth, Minnesota, 19°.8; Provincetown, Massachusetts, 19°; Marquette, Michigan, 14°.5. The smallest monthly ranges are: 2°.1 at Sandy Hook, New Jersey; 2°.7 at Portland, Oregon; 3°.5 at Wilmington, North Carolina; 3°.6 at Portland, Maine; 4° at Galveston, Texas. The highest water temperature recorded during the month, 93°, occurred at Jacksonville, Florida, on the 18th; the lowest, 43°3, occurred at Duluth, Minnesota, on the 29th.

*Temperature of Water for July, 1883.*

| STATION. | Temperature at bottom. | | Range. | Average depth, feet and inches. | | Mean temperature of the air at station. |
|---|---|---|---|---|---|---|
| | Max. | Min. | | | | |
| | ° | ° | ° | ft. | in. | ° |
| Atlantic City, New Jersey | 75.6 | 67.6 | 8.0 | 3 | 11 | 73.0 |
| Alpena, Michigan | 68.7 | 62.0 | 5.0 | 12 | 7 | 63.2 |
| Augusta, Georgia | 91.0 | 83.0 | 8.0 | 5 | 1 | 83.4 |
| Baltimore, Maryland | 82.0 | 77.0 | 5.0 | 9 | 10 | 76.8 |
| Block Island, Rhode Island | 72.4 | 62.5 | 9.9 | 8 | 6 | 69.9 |
| Boston, Massachusetts | 67.4 | 61.5 | 5.9 | 20 | 7 | 71.3 |
| Buffalo, New York | 74.5 | 67.2 | 7.3 | 10 | 10 | 67.2 |
| Cedar Keys, Florida | 91.9 | 79.5 | 12.4 | 11 | 2 | 83.8 |
| Charleston, South Carolina | 87.6 | 80.2 | 7.4 | 40 | 5 | 83.4 |
| Chicago, Illinois | 66.0 | 53.2 | 12.8 | 7 | 11 | 71.0 |
| Chincoteague, Virginia | 85.0 | 71.0 | 14.0 | 5 | 9 | 74.9 |
| Cleveland, Ohio* | 74.1 | 72.0 | 2.1 | 14 | 0 | 70.7 |
| Detroit, Michigan | 71.0 | 66.0 | 5.0 | 23 | 5 | 71.0 |
| Delaware Breakwater, Delaware | 75.1 | 67.3 | 7.8 | 9 | 3 | 73.6 |
| Duluth, Minnesota | 63.1 | 43.3 | 19.8 | 14 | 8 | 66.0 |
| Eastport, Maine | 47.7 | 43.7 | 4.0 | 16 | 4 | 66.2 |
| Escanaba, Michigan | 67.0 | 53.5 | 13.5 | 15 | 0 | 63.8 |
| Fort Macon, North Carolina | 85.0 | 78.0 | 7.0 | 12 | 3 | 79.8 |
| Galveston, Texas | 86.0 | 82.0 | 4.0 | 12 | 6 | 83.9 |
| Grand Haven, Michigan | 77.6 | 69.8 | 7.8 | 19 | 0 | 67.8 |
| Indianola, Texas | 88.7 | 81.5 | 7.2 | 7 | 11 | 82.5 |
| Jacksonville, Florida | 93.0 | 86.5 | 6.5 | 18 | 0 | 84.1 |
| Key West, Florida | 89.6 | 85.0 | 4.6 | 16 | 11 | 84.8 |
| Mackinaw City, Michigan | 65.0 | 55.8 | 9.2 | 13 | 0 | 62.5 |
| Marquette, Michigan | 58.5 | 44.0 | 14.5 | 9 | 10 | 62.0 |
| Milwaukee, Wisconsin | 62.4 | 48.7 | 13.7 | 8 | 0 | 67.6 |
| Mobile, Alabama | 89.2 | 84.3 | 4.9 | 16 | 6 | 83.6 |
| New Haven, Connecticut | 77.9 | 67.2 | 10.7 | 15 | 3 | 71.1 |
| New London, Connecticut | 70.0 | 62.0 | 8.0 | 12 | 11 | 71.2 |
| New York City | 76.5 | 71.0 | 5.5 | 17 | 5 | 73.3 |
| Norfolk, Virginia | 84.0 | 79.2 | 4.8 | 16 | 10 | 79.6 |
| Pensacola, Florida | 84.3 | 79.4 | 4.9 | 17 | 1 | 82.3 |
| Portland, Maine | 62.6 | 59.0 | 3.6 | 18 | 10 | 69.8 |
| Portland, Oregon | 67.8 | 65.1 | 2.7 | 62 | 10 | 66.9 |
| Provincetown, Massachusetts | 73.0 | 54.0 | 19.0 | 12 | 9 | 69.5 |
| Sandy Hook, New Jersey | 72.1 | 70.0 | 2.1 | 1 | 6 | 74.8 |
| San Francisco, California | 62.4 | 57.5 | 4.9 | 30 | 6 | 58.8 |
| Savannah, Georgia | 87.8 | 83.8 | 4.0 | 11 | 2 | 84.4 |
| Smithville, North Carolina | 87.0 | 81.0 | 6.0 | 10 | 0 | 81.5 |
| Toledo, Ohio | 80.7 | 69.7 | 11.0 | 11 | 7 | 73.5 |
| Wilmington, North Carolina | 86.0 | 82.5 | 3.5 | 20 | 6 | 81.5 |

* No record from 1st to 10th.

## VERIFICATIONS.

### INDICATIONS.

The detailed comparison of the tri-daily indications for July, 1883, with the telegraphic reports for the succeeding twenty-four hours, show the general average percentage of virifications to be 87.37 per cent. The percentages for the four elements are: weather, 88.34; direction of wind, 86.28; temperature, 88.90; barometer, 85 87 per cent. By geographical districts they are: For New England, 86.82; middle Atlantic states, 90.34; south Atlantic states, 84.58; eastern Gulf, 86.82; western Gulf, 89.81; lower lakes, 85.57; upper lakes, 87.98; Ohio valley and Tennessee, 87.05; upper Mississippi valley, 87.93; Missouri valley, 82.56; north Pacific, 100.0; middle Pacific, 100.0; south Pacific, 100.0

There were one hundred and twenty-one omissions to predict out of 3,813, or 3.17 per cent. Of the 3,692 predictions that have been made, eighty-four, or 2.27 per cent., are considered to have entirely failed; one hundred and one or 2.74 per cent. were one-fourth verified; four hundred and seven, or 11.02 per cent., were one-half verified; four hundred and twelve, or 11.16 per cent., were three-fourths verified; 2,688, or 72.81 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

### CAUTIONARY SIGNALS.

During July, 1883, sixty-seven cautionary signals were displayed. Of these, forty-eight, or 71.64 per cent., were justified by winds of twenty-five miles or more, per hour, at or within one hundred miles of the station. Eight cautionary off-shore signals were ordered, of which five, or 62.5 per cent., were justified both as to direction and velocity; six, or 75 per cent., were justified as to velocity only, and six, or 75 per cent., as to direction only. One cautionary signal was changed to an off-shore signal. Seventy-five signals, of all kinds, were displayed, of which fifty-three, or 70.66 per cent., were fully justified. These do not include signals ordered at display stations where the velocity of the wind is only estimated. One signal was ordered late.

One hundred and forty-four winds of twenty-five miles, or over, per hour were reported, for which no signals were ordered. Many of these were high local winds or strong sea-breezes.

## ATMOSPHERIC ELECTRICITY.

### AURORAS.

Brilliant auroral displays occurred on the nights of the 29th and 30th. They were generally observed from Dakota eastward to New England, and as far southward as southern Virginia. The following descriptions relate to the display of the 29th:

Boston, Massachusetts, 29th.—An auroral light was observed at 9.30 p. m., which gradually extended until the whole northern sky was covered with patches of light, with waves of the auroral light flashing across them. A bright band of yellow light, 4° in width, extended from the western sky to the zenith. At midnight an arch was formed, with a dark segment beneath it. The display continued until the morning of the 30th, gradually fading as the night advanced.

Philadelphia, Pennsylvania, 29th.—A faint auroral display was observed in this city between 10.30 and 11.30 p. m. A few light flashes of light appeared near the centre of the display.

Barnegat City, New Jersey, 29th.—A fine auroral display was witnessed at this place between 8.30 and 11.30 p. m. It first appeared as a bright light in the north, and later developed into beautiful "merry dancers." Brilliant beams appeared, reaching nearly to the zenith. At 10 p. m. the aurora assumed the form of an arch, which gradually faded away.

Washington, District of Columbia.—At 9.08 p. m., of the 29th, auroral streamers were plainly visible, extending to 20° above the northern horizon, and from N. 15° E. to N. 15° W. These streamers increased in brilliancy at 9.10 p. m., when irregular patches of bright red color appeared, having a seeming motion to the westward. At 9.30 p. m. there was left a bright hazy appearance in the northwest, without streamers.

Variety Mills, Virginia, 29th.—An auroral display was visible here from 9 to 10 p. m. It appeared as a steady glow of light near the northern horizon, extending from north to northeast. The display was partially obscured by clouds from 9 to 10 p. m., and became wholly obscured at 10.15 p. m.

Erie, Pennsylvania.—A faint auroral display was seen from 8.40 p. m. of the 29th until 2 a. m. of the 30th; it first appeared in the northeast and gradually extended westward.

Escanaba, Michigan, 29th.—The aurora was visible at this station from 9 p. m. until the early morning of the 30th. It first appeared as a large beam of straw-colored light, extending across the sky from the eastern to the western horizon. Later the entire northern sky became covered with the light, the beams converging to a point near the zenith. The display continued with considerable brilliancy until after midnight.

Saint Vincent, Minnesota, 29th.—The auroral display was visible at 9.30 p. m., at first consisting of single beams in the northeast; ten minutes later beams shot up from all parts of the horizon and continued until about 10 p. m., when the display became faint and gradually disappeared.

Fort Totten, Dakota, 29th.—An auroral display began at 9.20 p. m. in the northeastern sky; beams appeared, lasting until 10 p. m., when an auroral arch of great beauty was formed, with a dark segment beneath it. The display ended at 11.25 p. m.

The auroral display of the evening of the 30th was very similar to the one above described, and it was generally observed at the same stations.

Other displays were observed during the month, as follows:

1st.—Mount Washington, New Hampshire; Point Judith and Block Island, Rhode Island; Woodstock, Vermont; Oswego and Ithaca, New York; Lansing, Michigan; Morrison, Illinois; Bismarck, Dakota; Nebraska City, Nebraska.

2d.—Spokane Falls, Washington Territory: Wilkesbarre, Pennsylvania.

3d.—Northfield, Minnesota; Nebraska City, Nebraska.

4th, 5th, and 6th.—Northfield, Minnesota.

7th.—Menand Station (near Albany), New York; Wilkesbarre, Pennsylvania; Duluth and Northfield, Minnesota.

8th.—Eastport, Maine; Mount Washington, New Hampshire; Alpena, Michigan.

9th.—Eastport and Portland, Maine; Woodstock, Vermont; Amherst, Massachusetts; Point Judith and Block Island, Rhode Island; Oswego and Madison Barracks, New York; Alpena, Escanaba, Lansing, Marquette, and Mackinaw City, Michigan.

10th.—Escanaba and Swartz Creek, Michigan; Woodstock, Vermont; Eastport, Maine.

16th.—Northfield, Minnesota.

18th.—Escanaba, Michigan.

23d.—Fort Totten, Dakota.

24th.—Point Judith, Rhode Island; Menand Station (near Albany), New York.

26th.—Saint Vincent, Minnesota.

31st.—Narragansett Pier and Point Judith, Rhode Island; Woodstock, Vermont; New Bedford, Fall River, and Rowe, Massachusetts; Barnegat City, New Jersey; Wytheville, Virginia; Ithaca, New York; North Lewisburg, Ohio; Lansing and Thornville, Michigan; Morrison, Illinois; Lafayette, Indiana; Cresco and Nora Springs, Iowa; Ripon and Sussex, Wisconsin; Northfield, Minnesota.

The s. s. "Lord Gough," in N. 42° 41′, W. 61° 50′, at 2 a. m. (Greenwich mean time), of July 2d, observed a bright auroral display.

On the 5th the Norwegian bark "Saga," near N. 50° 20′, W. 40° 02′, saw northern lights.

### THUNDER STORMS.

Thunder storms were reported in the various districts on the following dates:

*New England.*—1st to 8th, 12th to 15th, 17th, 22d, 23d, 24th, 26th to 31st.

*Middle Atlantic states.*—1st to 8th, 11th to 17th, 21st to 24th, 26th to 29th, 31st.

*South Atlantic states.*—1st to 19th, 21st, 23d to 31st.

*Florida peninsula.*—1st to 8th, 10th, 11th, 14th to 22d, 24th to 29th, 31st.

*Eastern Gulf.*—1st to 9th, 12th, 17th, 21st, 22d, 24th to 31st.

*Western Gulf.*—1st to 11th, 12th, 13th, 16th to 19th, 21st, 22d, 24th to 31st.

*Tennessee.*—1st to 9th, 11th to 17th, 23d, 24th, 25th, 27th, 28th, 30th, 31st.

*Ohio valley.*—2d to 9th, 11th to 17th, 20th to 24th, 26th, 28th.

*Lower lakes.*—2d to 8th, 10th to 17th, 20th to 24th, 27th to 30th.

*Upper lakes.*—1st to 7th, 10th, 11th, 12th, 14th, 15th, 16th, 19th to 27th, 30th, 31st.

*Extreme northwest.*—2d, 6th, 10th, 11th, 13th, 14th, 15th, 19th to 23d, 25th, 26th, 30th, 31st.

*Upper Mississippi valley.*—1st to 17th, 19th to 24th, 26th, 27th, 30th, 31st.

*Missouri valley.*—1st to 8th, 10th to 30th.

*Northern slope.*—2d to 6th, 8th to 11th, 13th, 15th, 19th, 21st, 22d, 24th, 25th, 29th, 30th, 31st.

*Middle slope.*—2d to 15th, 17th to 21st.

*Southern slope.*—3d, 5th to 9th, 11th to 15th, 20th, 22d, 23d, 25th, 26th, 27th, 31st.

*Southern plateau.*—1st to 6th, 8th to 12th, 17th to 31st.

*Middle plateau.*—1st, 3d, 4th, 6th, 9th, 13th, 20th, 21st, 26th, 28th to 31st.

*Northern plateau.*—10th, 29th.

*Pacific coast.*—Roseburg, Oregon, 8th, 9th; Fort Klamath, Oregon, 9th; Oakwood, California, 10th; Fort Bidwell, California, 26th.

Instances of damage by lightning during the month of July have been very numerous. The following are some of the more important cases:

Milwaukee, Wisconsin: a man and horse were killed by lightning on the street in this city on the morning of the 4th.

Scranton, Pennsylvania: several objects were struck by lightning at Dickson City, near here, on the night of 5–6th.

Detroit, Michigan: considerable damage was done to the instruments by lightning at the telephone exchange on the 11th.

Underhill, Chittenden county, Vermont: during a heavy thunder storm on the 13th a schoolhouse was struck by lightning, and all of the pupils were more or less injured. The floor of the school room was torn up, and the walls and ceilings were wrecked, and large holes were made in the ground in the school yard. Several trees near by were also struck.

Portland, Maine: several objects in this city and vicinity were struck by lightning and damaged to a more or less extent during the thunder storm of the 13th.

Nashua, New Hampshire: at 5 p. m., of the 13th, a residence in this city was struck by lightning and one person killed. Damage by lightning on this date was done at numerous points in New Hamsphire and Vermont.

Latrobe, Westmoreland county, Pennsylvania: a large barn at Pleasant Unity, in this county, was struck by lightning and destroyed on the afternoon of the 13th, causing damage estimated at more than $4,000.

Cleveland, Ohio: during the thunder storm of the 13th numerous objects in and about the city were struck by lightning, and damaged to a more or less extent.

Anna, Union county, Illinois: a man and team were killed by lightning at this place on the 13th.

Fidelity, Jersey county, Illinois: at about 4 p. m., of the 16th, a dwelling at this place was struck and badly damaged by lightning. Nearly all of the plastering and weather boarding were torn from the west end of the building, the windows were broken, and the chimney was burst from top to bottom.

Carthage, Jasper county, Missouri: a large barn and slaughter house at this place was struck by lightning and burned on the evening of the 17th. Several barns and other buildings were struck by lightning at Marshall, Saline county, in this state.

Jacksonville, Florida: numerous objects were struck and damaged by lightning during the thunder storm on the 18th.

Sanford, Florida: buildings at this place were injured by lightning on the 1st and 18th.

Wabasha, Wabasha county, Minnesota: during the thunder storm of the night of the 19th a dwelling was struck by ligning and burned.

Grand Haven, Michigan: on the 21st lightning struck the building in which the signal office is located, demolishing a flag-staff and damaging instruments.

Bismarck, Dakota: the building in which the signal office is located was struck by lightning and set on fire on the 23d.

Rich Hill, Bates county, Missouri: during a thunder storm, on the 24th, a man and team were killed by lightning.

Dayton, Washington Territory: the signal office and instruments were damaged by lightning on the 29th.

New London, Connecticut: four barns and two dwellings in the vicinity of this city were struck by lightning on the 29th, the damage caused being estimated at $3,500.

Leavenworth, Kansas: seven barns in this locality were struck by lightning on the 30th.

### ATMOSPHERIC ELECTRICITY INTERRUPTING TELEGRAPHIC CONNECTION.

Fort Macon, North Carolina: 29th.

Fort Stockton, Texas: 24th.

On the summits of Pike's Peak, Colorado, on the 14th and 25th, the atmosphere was highly charged with electricity, which had a peculiar effect upon the instruments.

## OPTICAL PHENOMENA.

### SOLAR HALOS.

Solar halos have been observed in the various districts on the following dates:

*New England:*—Provincetown, Massachusetts, 3d; Rowe, Massachusetts, 11th and 27th; Cornish, Maine; Strafford and Woodstock, Vermont, 24th; New Haven, Connecticut, 31st.

*Middle Atlantic states.*—Cape Henry, Virginia, 8th and 9th.

*South Atlantic states.*—Augusta, Georgia, 3d; Charleston, South Carolina, and Hatteras, North Carolina, 4th; Jacksonville, Florida, 17th.

*Eastern Gulf.*—Pensacola, Florida, 3d, 26th, 30th; Vicksburg, Mississippi, 25th.

*Western Gulf.*—Indianola, Texas, 1st; Lead Hill, Arkansas, 2d, 13th, 17th, 29th; Little Rock, Arkansas, 17th, 19th; Palestine, Texas, 27th.

*Tennessee.*—Nashville and Murfreesborough, 11th; Memphis, 12th, 19th, 30th.

*Ohio valley.*—Louisville, Kentucky, 10th; Frankfort, Kentucky, 10th, 20th; Vevay, Indiana, 4th, 28th; Laconia, Indiana, 13th; Griffin station, Indiana, 20th; Westerville, Ohio, 25th.

*Lower lakes.*—Cleveland, Ohio, 2d, 9th; Oswego, New York, 15th; Toledo, Ohio, 20th.

*Upper lakes.*—Lansing, Michigan, 2d, 20th, 29th; Swartz Creek, Michigan, 9th, 20th.

*Extreme northwest.*—Saint Vincent, Minnesota, 19th; Fort Buford, Dakota, 28th.

*Upper Mississippi valley.*—Cresco, Iowa, 7th; Polo, Illinois, 13th, 25th, 26th; Anna, Illinois, 13th, 29th; Saint Louis, Missouri, 17th; Monticello, Iowa, 20th; Swanwick, Illinois, 29th.

*Missouri valley.*—Nebraska City, Nebraska, 7th; De Soto, Nebraska, 7th, 21st, 24th, 26th, 31st; Johnson, Nebraska, 12th.

*Middle slope.*—Pike's Peak, Colorado, 11th; Yates Centre, 13th, 15th, 17th, 19th, 25th.

*California.*—Sacramento, 11th; San Francisco, 11th.

*Utah.*—Nephi, 4th.

### LUNAR HALOS.

Lunar halos have been observed in the various districts on the following dates:

*Middle Atlantic states.*—Freehold, New Jersey, 14th; Wytheville, Virginia, 12th, 14th, 17th, 23d; Johnstown, Virginia, 15th; Barnegat City, New Jersey, 17th; Albany, New York, 16th; Delaware Breakwater, Delaware, 17th; Philadelphia, Pennsylvania, 17th, 20th, 21st, 22d; West Washington, District of Columbia, 17th; Woodstock, Maryland, 17th, 19th; Lynchburg, Virginia, 20th.

*South Atlantic states.*—Hatteras, North Carolina, 4th; Jacksonville, Florida, 20th.

*Florida peninsula.*—Sanford, 11th, 12th, 13th; Limona, 14th, 15th; Key West, 15th.

*Eastern Gulf.*—New Orleans, Louisiana, 10th, 11th.

*Western Gulf.*—Galveston, Texas, 8th to 11th; Lead Hill, Arkansas, 10th; Fort Smith, Arkansas, 16th; Indianola, Texas, 15th to 18th, 20th; Little Rock, Arkansas, 17th, 25th; Point Pleasant, Louisiana, 18th.

*Tennessee.*—Murfreesborough, 14th; Memphis, 25th.

*Ohio valley.*—Vevay, Indiana, 10th, 19th, 20th.

*Lower lakes.*—Buffalo, New York, 16th; North Volney, New York, 21st.

*Upper lakes.*—Grand Haven, Michigan, 12th, 13th; Port Huron, Michigan, 13th; Lansing, Michigan, 12th, 20th; Manitowoc, Wisconsin, 14th; Swartz Creek, Michigan, 15th; Northport, Michigan, 15th; Chicago, Illinois, 16th; Milwaukee, Wisconsin, 18th; Marquette, Michigan, 20th.

*Extreme northwest.*—Bismarck, Dakota, 15th.

*Upper Mississippi valley.*—Anna, Illinois, 10th; Cairo, Illinois, 10th, 11th; Dubuque, Iowa, 13th, 14th, 15th; Davenport, Iowa, 14th; Madison, Wisconsin, 14th; Keokuk, Iowa, 15th; Saint Louis, Missouri, 13th, 24th.

*Missouri valley.*—Fort Scott, Kansas, 15th; De Soto, Nebraska, 15th.

*Middle slope.*—Dodge City, Kansas, 12th; Fort Supply, Indian Territory, 17th.

*Southern slope.*—Fort Concho, Texas, 14th; Fort Stockton, Texas, 15th, 18th, 19th, 20th, 21st.

*Northern plateau.*—Lewiston, Idaho, 14th.

### MIRAGE.

Northport, Michigan.—From 3 to 4:30 p. m., of the 23d, a forest twelve miles northeast of this place appeared to be about one hundred feet above the horizon.

Mirage was also observed at Indianola, Texas, on the 2d, 18th, 20th, and 28th.

## MISCELLANEOUS PHENOMENA.

### SUN SPOTS.

Sun spots were observed by Mr. William Dawson at Spiceland, Indiana, as follows:

1st.—Three groups; one hundred spots; two large spots close together near the centre of the sun were easily seen without telescope.

3d.—Four groups; seventy spots; the large spots still seen without telescope.

5th.—Two groups; forty spots; same number of groups and spots were also seen on the 7th and 9th, but on the latter date one large group had disappeared by rotation and a new and very prominent group appeared at the edge of the sun.

13th.—Seven groups; sixty spots; mostly in the eastern hemisphere, power 50 (generally use power of 100).

16th.—Eight groups; ninety spots; large group near the east edge.

17th.—Eight groups; one hundred and ten (?) spots; some cloud; a nearly straight row of groups extends across the sun's disc.

19th.—Ten groups; one hundred and sixty-five spots; very large group slightly east of the centre.

21st.—Seven groups; one hundred and eighty-five spots; one group of fifty spots near the east edge, and another group southwest of the centre with nearly as many spots.

24th.—Eight groups; two hundred and thirty spots (largest number observed for about eight years); one group in southeast quadrant had one hundred and thirty spots; three or four of them near together in one penumbra about 50,000 miles diameter, and plainly visible to the unassisted eye. This would seem to be the current maximum, although it was thought to have occurred in April, 1882.

25th.—The large spot has changed considerably.

27th.—Six groups; one hundred and ten (?) spots.

28th.—Six groups; fifty-six spots. The great penumbra and spots were much broken on this date, although they were plainly seen with a shade glass only.

29th.—Three groups; thirty-five spots. The large spot was near the west edge, and scarcely visible to the naked eye.

31st.—Five groups; fifty-two spots. On this date the large group had disappeared by rotation and a new group of twenty-four spots appeared in the southeast quadrant.

Roseburg, Oregon.—A small black spot was visible on the sun's disc on the 29th. It was still visible on the 30th, but had diminished in size.

Fort Wayne, Indiana.—Sun spots were seen at this place on the 1st, with the unassisted eye.

Carson City, Nevada.—Two large spots were observed near the centre of the sun's disc at noon of the 1st.

The s. s. "Donau," near N. 43° 14′, W. 57° 39′, on the 27th, saw a dark spot near the centre of the sun; it moved westward, and on the 28th was seen near the west edge of the sun.

The s. s. "Llandaff City," from New York to Bristol, observed, on the 17th, a very large spot on the sun; it was also seen on several days afterwards, altering its position each day.

Albany, Oregon, 31st.—The smoky state of the atmosphere, caused by the continued forest fires, afforded favorable opportunity for observing the sun spots with the naked eye. The spots were very distinct, as much so as the recent "transit of Venus," which they very much resembled.

The following record of sun spots for the month of July 1883, has been forwarded by Professor D. P. Todd, Director of the Lawrence Observatory, Amherst, Massachusetts:

| Date—July, 1883. | No. of new | | Disappeared by solar rotation. | | Reappeared by solar rotation. | | Total No. visible. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | Gr'ps | Spots | Gr'ps | Spots | Gr'ps | Spots | Gr'ps | Spots | |
| 1, 7 a. m. | 0 | 0 | 1 | 5 | 0 | 0 | 3 | 40‡ | Two of spots quite large. |
| 1, 4 p. m. | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 40‡ | |
| 2, 7 a. m. | 0 | 0 | 0 | 5 | 0 | 0 | 3 | 35‡ | |
| 3, 7 a. m. | 1 | 10‡ | 0 | 0 | 1 | 5 | 4 | 45‡ | |
| 5, 7 a. m. | 0 | 5 | 2 | 20‡ | 0 | 5 | 2 | 30‡ | Spots probably disappeared by solar rotation. |
| 6, 8 a. m. | 0 | 10 | 0 | 10 | 0 | 10 | 2 | 30‡ | |
| 6, 6 p. m. | 0 | 5 | 0 | 5 | 0 | 5 | 2 | 30‡ | |
| 7, 7 a. m. | 0 | 5 | 0 | 3 | 0 | 0 | 2 | 32‡ | |
| 8, 9 a. m. | 0 | 0 | 1 | 7 | 0 | 0 | 1 | 23 | |
| 9, 6 p. m. | 1 | 5 | 0 | 3 | 1 | 5 | 2 | 25‡ | |
| 10, 8 a. m. | 1 | 5 | 0 | 0 | 0 | 0 | 3 | 30‡ | |
| 10, 5 p. m. | 1 | 10‡ | 0 | 0 | 1 | 6 | 4 | 40‡ | Many of the spots small. |
| 11, 7 a. m. | 0 | 10 | 0 | 0 | 0 | 0 | 4 | 50‡ | Do. |
| 12, 8 a. m. | 2 | 20‡ | 0 | 5 | 1 | 2 | 6 | 65‡ | Do. |
| 13, 7 p. m. | 0 | 0 | 0 | 15‡ | 0 | 0 | 6 | 50‡ | Do. |
| 14, 12 m. | 0 | 0 | 0 | 5 | 0 | 0 | 6 | 35‡ | Do. |
| 16, 2 p. m. | 2 | 15‡ | 1 | 5 | 2 | 15‡ | 7 | 45‡ | Do. |
| 17, 3 p. m. | 2 | 10‡ | 0 | 0 | 1 | 7 | 9 | 55‡ | Do. |
| 18, 9 a. m. | 0 | 10‡ | 1 | 2 | 0 | 10‡ | 7 | 60‡ | |
| 19, 10 a. m. | 2 | 15‡ | 0 | 0 | 1 | 5 | 9 | 75‡ | |
| 20, 10 a. m. | 1 | 15‡ | 2 | 5 | 1 | 3 | 8 | 85‡ | |
| 21, 9 a. m. | 0 | 0 | 1 | 5 | 0 | 0 | 7 | 80‡ | |
| 22, 1 p. m. | 1 | 2 | 0 | 5 | 1 | 2 | 8 | 75‡ | |
| 23, 6 p. m. | 0 | 0 | 0 | 5 | 0 | 0 | 8 | 70‡ | |
| 24, 9 a. m. | 0 | 0 | 1 | 2 | 0 | 0 | 6 | 60‡ | |
| 25, 4 p. m. | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 60‡ | |
| 26, 6 a. m. | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 60‡ | |
| 26, 6 p. m. | 0 | 0 | 0 | 5 | 0 | 0 | 6 | 55‡ | |
| 27, 7 a. m. | 0 | 0 | 0 | 10‡ | 0 | 0 | 5 | 40‡ | |
| 28, 6 a. m. | 0 | 10‡ | 1 | 5 | 0 | 0 | 4 | 45‡ | |
| 29, 8 a. m. | 0 | 0 | 1 | 5 | 0 | 0 | 3 | 40‡ | |
| 29, 4 p. m. | 1 | 5 | 0 | 0 | 0 | 0 | 4 | 45‡ | Also many veiled spots and broad areas of faculæ. |
| 30, 7 a. m. | 1 | 10‡ | 0 | 5 | 0 | 0 | 5 | 50‡ | Broad areas of faculæ. |
| 31, 8 a. m. | 0 | 15‡ | 0 | 10‡ | 0 | 0 | 5 | 55‡ | Faculæ quite numerous. |

Faculæ were seen at the time of every observation. ‡Approximated.

### SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal-Service stations. Reports from one hundred and forty-four stations show 4,382 observations to have been made, of which eight were reported doubtful; of the remainder, 4,374, there were 3,607, or 82.2 per cent., followed by the expected weather.

## METEORS.

A brilliant meteor fell at Lachine, Province of Quebec, on July 7th, during a rain shower in the forenoon. It is reported to have resembled a huge mass of fire descending towards the earth in a diagonal direction. It had a nucleus that appeared about four feet square, and its flight through the air caused a strange indescribable noise. Before and during the shower there was nothing to indicate that the air was unusually charged with electricity. It is thought that this aerolite fell into a stream near Stony Point.

Sloop Point, North Carolina.—A brilliant meteor, surrounded by a yellowish halo, and passing in a northeast direction was seen at this place at 9:10 p. m. of the 7th.

Portland, Maine.—At 11.50 p. m. of the 11th, a meteor, apparently about the size of an ordinary foot-ball, appeared above the north-northwestern horizon, and followed the course of a band of auroral light which extended from the horizon to the zenith. The meteor passed with remarkable slowness, and was of an intensely whitish color, throwing off a train of light bright red sparks. It passed directly overhead, and seemed to be not more than three hundred feet above the earth. When about 20° above south-southeastern horizon it disappeared, leaving a few sparks which slowly floated away. No cloud was observed, nor was any explosion heard. This meteor was also observed at Bath, Maine; Montreal, Canada; and at many other points east and north of Portland.

Bath, Maine.—Just before midnight of the 11th, a meteor was seen moving over this place from northwest to southeast, shedding a pale yellowish light, but leaving no trail. After disappearing, a faint rumbling sound was heard resembling an explosion.

Indianapolis, Indiana.—A brilliant meteor was seen in this city, just before midnight of the 11th, producing a light sufficient to cast shadows.

Quebec, Province of Quebec.—A brilliant meteor of immense size was seen to fall slowly over the southeastern sky shortly after midnight of 11–12th, leaving behind it a train of bluish light.

Cairo, Illinois.—At 7:50 p. m., of the 20th, a bright meteor of light blue color was seen to pass from a point 20° south of the zenith toward the northern horizon, disappearing when at an altitude of about 15°. Its apparent size was about one-half of that of the full moon; it left a train of light 15° in length.

Nashville, Tennessee.—A bright meteor was observed at 10.35 p. m. of the 26th. It started from a point 15° east of "Polaris" and disappeared when about 10° above the horizon, leaving a track of bright red.

Menand Station, (near Albany) New York.—At 9:30 p. m., of the 29th, a meteor was observed at an altitude of about 45°, and before disappearing in burst into many brilliant fragments.

Meteors of less brilliancy are reported to have been seen during the month, as follows:

2d.—Davenport, Iowa.
8th.—Nebraska City, Nebraska.
9th.—Saint Vincent, Minnesota.
22d.—Lead Hill, Arkansas; Davenport, Iowa.
23d.—Memphis, Tennessee.
24th.—Little Rock, Arkansas; Indianola, Iowa; Woodstock, Maryland; Memphis, Tennessee.
25th.—West Washington, District of Columbia; Griffin Station, Indiana; Woodstock, Vermont; Wytheville, Virginia; Davenport, Iowa; Memphis, Tennessee; Rowe, Massachusetts.
26th.—Marion, Virginia; Bristol, New Hampshire; Little Rock, Arkansas.
27th.—Davenport, Iowa.
28th.—Morrison, Illinois; Fort Scott, Kansas.
29th.—Woodstock, Maryland; Chambersburg, Pennsylvania; Davenport, Iowa.
30th.—Moorestown, New Jersey; Woodstock, Maryland; Davenport, Iowa.
31st.—Moorestown, New Jersey.

## EARTHQUAKES.

Carson City, Nevada.—A slight shock of earthquake occurred at this place at 3 a. m. of the 1st.

Cairo, Illinois.—A light earthquake shock was felt here at 11.15 a. m., of the 6th, lasting about five seconds. On the 14th, at 1.30 a. m., a light shock occurred, lasting eight seconds. The wave was from west to east.

Los Angeles, California.—At 10.50 p. m., of the 7th, an earthquake shock was felt at this place. The tremor of the building in which the signal office is located was very perceptible. Owing to the very short duration of the shock, the direction of its vibration was not determined.

The town of Casamicciola, on the island of Ischia, near Naples, Italy, was almost entirely destroyed by an earthquake on the night of July 28th. The shocks began at 9.30 p. m. The first indication of the disturbance was a low rumbling, which presently burst into a deafening roar, as though heavy artillery were being continuously fired in the immediate vicinity. For a second or two the houses rocked to and fro, and then were shattered into fragments. A few of the inmates reached the open air before the crash came, but the vast majority were buried in the falling ruins. For fifteen seconds there were upheavals of the earth in all directions, and many of the inhabitants, flying toward the shore, were buried beneath the overwhelming quantities of debris. All the lights were extinguished, and to add to the horror of the situation, a dense cloud of dust, blinding and suffocating the survivors, hung over the ruins, and tottering houses continued to fall on the people who were seeking shelter from the general ruin. The site of the town is hilly, and the houses have been thrown on one another; at short distances apart are deep cracks in the ground. There is not a single building left standing at Casamicciola, except three cottages and a little church, the latter having been unroofed. At Lacco Ameno, the condition of affairs was, if anything, worse than at Casamicciola. Not a single building can be traced out of the mass of timber and stones which now marks where the village once stood. The inhabitants of the village numbered 1,593, but of that number only five persons are known to have escaped destruction. Some of the houses have disappeared bodily, apparently falling into the fissures when the earth opened. At Fario, the damage, though not so extensive, is very great. The earthquake appears to have run across the island from west to east, and, besides the above-mentioned towns, all the adjacent villages and hamlets have suffered more or less. The first and most fatal shock was accompanied by a noise resembling loud thunder; the succeeding shocks were less clearly marked, but they served to extend the devastation and to complete the panic that had set in throughout the island. The previous weather had been splendid, but a violent storm occurred on the day following the disaster, and this, accompanied by an almost total darkness, added greatly to the horror of the scene, and rendered transit from the island to the main land very difficult. It is pointed out as significant that Vesuvius had been unusually active just before the shock.

The following notes, relating to earthquakes occurring in America, have been collected and forwarded by Professor C. G. Rockwood, jr., of Princeton, New Jersey:

Panama, United States of Columbia.—On July 7th, at midnight, and at 2 a. m., of the 9th, sharp shocks of earthquake were felt at San Salvador.

At 4.48 p. m., of July 20th, a severe earthquake shock was felt at Panama. Its direction was from west to east.

The Ometpe volcano, in Nicaragua, continues in eruption, and all the inhabitants of the town of that name have emigrated to the mainland.

Wickliffe, Ballard county, Kentucky.—The earthquake shock which occurred at Cairo, Illinois, on the 14th, was also felt at this place, breaking some of the window-glass in the court house.

San Franciso, California.—Reports from Gilroy, California, state that two shocks of earthquake were felt at that place on the evening of the 30th.

Valparaiso, Chili.—A sharp shock of earthquake was felt here at 2.55 a. m., of June 23d; and on June 21st and 23d. Several shocks were experienced at Los Andes, Chili.

DROUGHT.

*Arkansas.*—Fort Smith, 4th: cotton and corn are suffering from drought in this part of the state.

Little Rock, 23d: the weather continues very hot and dry, and crops are suffering in consequence, especially in the western part of this state.

*Dakota.*—Jamestown, Stutsman county: there was a fine rain throughout the James river valley on the 13th. The crops were injured by the previous drought, but the rain of this date will insure a fair yield of wheat.

Bismarck, 11th: but little rain had fallen in this immediate vicinity since June 23d, and the crops were suffering seriously for rain. On this date a slight shower of rain fell at this place. Heavy rain fell a few miles north, and refreshing showers are reported from points southward.

*Georgia.*—The following extract is taken from the July crop report for the state of Georgia:

* * * * * *

In the southern half of the state the seasons were fair during the month of June, even too much rain in some places, but generally sufficient to maintain a healthy growth and development up to the 1st of July. In northern and middle Georgia, however, the drought has been almost continuous since April 23d,—the date of the last general rain in the state—broken only by light and ineffective showers at considerable intervals. A few points reported sufficient rain, but the northern half of the state, with these exceptions, has suffered a most prolonged drought, which is yet unrelieved.

* * * * * *

*Kansas.*—Yates Centre, Woodson county: the first three weeks of July were very dry, and the crops in this locality suffered from the effects of drought.

Manhattan, Riley county: from the 19th to the 22d very warm and dry south-southwest winds prevailed, which proved very injurious to crops; but fine rains fell on the 26th.

*Mississippi.*—Vicksburg, 31st: corn and vegetables suffered serious injury during the latter part of the month, in consequence of drought.

*Minnesota.*—Moorhead, 9th: the crops in this part of the state are suffering for rain.

*Montana.*—Fort Assinniboine, 11th: the weather in this part of the territory is very dry, and crops are suffering from the effects of drought.

*Oregon.*—Roseburg, 3d: crops in this locality are suffering from drought.

*South Carolina.*—Darlington, Darlington county, 27th: the drought began in this part of the state about the 2d or 3d of July, but up to this date the crops have not suffered to a great extent. In some sections of Darlington county the drought has already been ended by the recent rains. It is estimated that the crops have not been damaged to a greater extent than twenty-five per cent.

*Tennessee.*—Chattanooga, 5th: the crops in this locality are suffering from drought. 30th: drought continues.

The following extract is taken from the July report of the Commissioner of Agriculture for the state of Tennessee:

* * * * * *

The rainfall during the past month has been rather unevenly distributed. In some localities the extensive rains have greatly injured the crops of wheat, oats, and hay that had been cut, causing the former to sprout, and rendering much of it unmarketable, while in other localities a continuous drought has materially lessened the chances for the growing crops, which were full of sap, and it will require very favorable conditions during the coming month to even partially restore them.

* * * * * *

*Texas.*—Dallas, Dallas county, 2d: the crops in the surrounding country are suffering from the effects of drought, no rain having fallen since June 11th.

Palestine, Anderson county, 28th: the rain of this date proved a great benefit to the crops in this part of the state. No rain had fallen since July 10th, and the crops were suffering seriously.

*Virginia.*—Lynchburg 31st: the protracted drought has proved very injurious to the corn crop in this vicinity. During the month of July only 0.19 inch of rain fell, which is 2.74 inches below the July average, and only about one-fifteenth of the average July rainfall for the last eleven years at this place.

FOREST AND PRAIRIE FIRES.

Portland, Oregon, 9th: extensive forest fires are reported from the Tillamook country and along the lower Columbia river, while, in this locality, the fires have been in progress for two weeks. It is not possible to estimate the damage of these conflagrations, but it is considered that it will exceed one million dollars. Much of the timber destroyed was on Government lands. Unusually the frequent summer rains keep the forests in this state comparatively damp, but the recent long-continued dry weather has so dried the evergreen fir trees that they burn like tinder. Large quantities of valuable cedar lumber have been destroyed. An extensive logging camp near Oak Point has sustained damage estimated at $100,000. In that locality the fire raged to such an extent that it could not be approached and, therefore, no estimate of the total damage could be made. These fires were the most destructive ever known to have prevailed in Oregon or Washington Territory. No lives were reported lost.

Albany, Oregon, 31st: forest fires in both the Coast and Cascade mountain ranges have made the atmosphere very smoky throughout the month, with the exception of a few days while the wind was from the west.

Prairie and forest fires have also been reported from the following stations:

Fort Buford, Dakota: 24th and 25th.
Fort Supply, Indian Territory: 20th and 21st.
Coeur d'Alene, Washington Territory: 15th, 19th, and 31st.
Spokane, Washington Territory: 28th and 31st.
Dayton, Washington Territory: 9th and 18th.
Roseburg, Oregon: 2d to 10th, and 16th to 22d.

POLAR BANDS.

Polar bands have been observed on the various dates as follows:
1st.—Lead Hill, Arkansas.
2d.—Los Angeles, California.
5th.—Salina, Kansas.
8th.—Nebraska City, Nebraska.
10th.—Los Angeles, California.
15th.—Memphis, Tennessee.
16th.—Lead Hill, Arkansas.
18th.—Augusta, Georgia.
20th.—Marion, Virginia.
21st.—Lead Hill, Arkansas.
22d.—Pensacola, Florida; Lead Hill, Arkansas.
23d.—Yates Centre, Kansas.
24th.—Lead Hill, Arkansas.
26th.—Toledo, Ohio; Los Angeles, California.
28th.—Lead Hill, Arkansas.
29th.—Nashville, Tennessee.
30th.—Wytheville, Virginia.
31st.—Morrison, Illinois.

INSECTS.

Portland, Maine, 10th.—Reports from Lewiston state that a species of wingless grass-hopper has appeared in that locality and has done a large amount of damage to the crops.

Erie, Pennsylvania, 13th.—A swarm of locusts appeared in Chautauqua county, New York, and is moving westward along the shore, destroying all vegetation before it.

Lancaster, Pennsylvania, 16th.—The army worm has made its appearance in large numbers in the northern part of this (Lancaster) county, and is doing much damage to the tobacco fields.

Montgomery, Alabama, 20th.—The cotton worm is reported very generally in this section.

SAND STORMS.

Fort Concho, Texas, 2d, 3d.
Coleman City, Texas, 2d.

**Camp Thomas, Arizona, 3d.**
**Yuma, Arizona, 3d.**
**Fort Yates, Dakota, 13th.**

ZODIACAL LIGHT.

**Pensacola, Florida, 5th.**
**Elk Falls, Kansas, 18th.**
**Nashville, Tennessee, 22d, 23d, 26th, 29th.**
**Northport, Michigan, 31st.**

NOTES AND EXTRACTS.

**The following meteorological summary and table are taken from the July report of the "Tennessee Weather Service":**

SUMMARY.

Mean temperature, 74°.
Highest temperature, 98°, on the 27th at Grief.
Lowest temperature, 56°, on the 10th at Andersonville and Beech Grove.
Range of temperature, 42°.
Mean daily range of temperature, 14°.
Greatest daily range of temperature, 31°, on the 2d at Andersonville, and on the 20th at Grief.
Least daily ranges of temperature, 0°, on the 7th at Smithville; 1° on the 4th and 6th at Milan; on the 14th at Riddleton; and on the 15th and 30th at McMinnville.
Mean depth of rain, 3.88 inches.
Greatest depth of rain, 6.99 inches at Gadsden.
Least depth of rain, 1.20 inches at Grandview.
Average number of clear days, 9½
Average number of fair days, 11.
Average number of cloudy days, 10½.
Average number of days on which rain fell, 9⅔.
Prevailing direction of wind, southwest.

*Abstract of meteorological observations for the month of July, 1883, as reported to the Bureau of Agriculture, &c., of Tennessee, by voluntary observers in co-operation with General W. B. Hazen, Chief Signal Officer, U. S. A.*

| County. | Station. | Latitude north. | Longitude west of Washington. | Temperature. Mean of 7 a. m. | Mean of 2 p. m. | Mean of 9 p. m. | Average monthly. | Highest. | Date. | Lowest. | Date. | Wind. Prevailing direction. | Greatest force. Scale 0 10. | Date. | Number of days— Clear. | Fair. | Cloudy. | Auroras. | Dew. | Fog. | Frost. | Lunar halos. | Solar halos. | Hail storms. | Thunder storms. | On which rain fell, including hail, snow, and sleet. | Total rainfall, including hail, snow, and sleet (in inches). | Observers. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ° ′ | ° ′ | ° | ° | ° | ° | ° | | ° | | | | | | | | | | | | | | | | | | | |
| Anderson | Andersonville | 36 15 | 0 58 | 66 | 82 | 74 | 74 | 96 | 22 | 56 | 10 | n. | br. | 22 | 1 | 20 | 9 | ..... | 3 | 5 | ..... | ..... | ..... | ..... | 1 | 8 | 3.06 | J. K. P. Wallace, 3od. |
| Bedford | Flat Creek | 35 30 | 9 40 | 73 | 84 | 73 | 77 | 90 | 3 | 62 | 10 | nw. | br. | 24 | 10 | 11 | 10 | ..... | 18 | 4 | ..... | ..... | ..... | ..... | 14 | 14 | 4.20 | William Hart. |
| Blount | Maryville, 960 ft | 35 45 | 7 00 | 72 | 78 | 70 | 70 | 96 | 5 | 66 | 11 | w. | br. | 15 | 9 | 12 | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8 | 2.95 | W. H. Henry. |
| Bradley | Grief | 35 11 | 7 42 | 74 | 90 | 74 | 79 | 98 | 27 | 62 | 31 | n. | br. | 7 | 3 | 21 | 7 | ..... | ..... | 2 | ..... | ..... | ..... | ..... | 6 | 6 | 1.81 | J. T. Cowden. |
| Campbell | Caryville | 36 00 | 7 30 | 70 | 82 | 09 | 73 | 90 | 22 | 60 | 11 | se. | br. | 13 | 3 | 16 | 12 | ..... | ..... | 4 | ..... | ..... | ..... | ..... | ..... | 6 | 1.42 | Fletcher Smith. |
| Carroll | Huntingdon | 36 00 | 11 20 | 74 | 82 | 74 | 77 | 90 | 24 | 62 | 31 | sw. | h. | 6 | 8 | 15 | 8 | ..... | 23 | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 6.38 | A. W. Hawkins. |
| Carroll | McKenzie, 815 ft | 36 10 | 11 30 | 78 | 89 | 79 | 82 | 96 | 4 | 68 | 30 | sw. | br. | 4 | 14 | 14 | 3 | ..... | 12 | 1 | ..... | ..... | ..... | ..... | 1 | 12 | 4.77 | John Brown. |
| Cheatham | Kingston Springs | 36 10 | 10 04 | 72 | 86 | 77 | 78 | 90 | 3 | 60 | 10 | s. | br. | 8 | 13 | 11 | 7 | ..... | 13 | 9 | ..... | ..... | ..... | ..... | 3 | 10 | 5.10 | W. J. Inman. |
| Coffee | Manchester | 35 20 | 9 04 | 71 | 79 | 72 | 74 | 91 | 3 | 68 | 30 | nw. | h. | 5 | 4 | 18 | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8 | 4.21 | Wiley Hickerson. |
| Coffee | Beech Grove, 1,050 ft | 35 30 | 9 06 | 65 | 82 | 72 | 73 | 90 | 22 | 56 | 10 | sw. | br. | 8 | 18 | 1 | 12 | ..... | 21 | ..... | ..... | ..... | ..... | ..... | 12 | 14 | 3.35 | B. F. Cheatham. |
| Cumberland | Grassy Cove | 30 00 | 8 00 | 54 | 77 | 08 | 64 | 88 | 22 | 57 | 10 | s. | l. | ..... | 16 | 4 | 10 | ..... | 17 | 15 | ..... | 3 | ..... | ..... | 10 | 15 | 2.10 | Nettie M. Stratton. |
| Crockett | Gadsden | 35 45 | 12 00 | 72 | 83 | 73 | 76 | 91 | 24 | 62 | 10 | w. | h. | 12 | 11 | 13 | 7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 14 | 6.99 | M. T. Moore. |
| DeKalb | Smithville (near) | 35 00 | 8 40 | 71 | 82 | 72 | 75 | 88 | 22 | 64 | 9 | sw. | l. | 23 | 9 | 10 | 9 | ..... | 14 | ..... | ..... | ..... | 1 | ..... | 3 | 9 | 2.60 | P. C. Bluhm, (29d's.) |
| Dickson | White Bluff | 36 10 | 10 04 | 75 | 85 | 75 | 78 | 95 | 22 | 60 | 30 | s. | h. | 11 | 13 | 7 | 11 | ..... | 10 | 4 | ..... | ..... | ..... | ..... | 4 | 11 | 5.80 | Prof. W. G. McMillan. |
| Dyer | Dyersburg | 36 15 | 12 20 | 72 | 83 | 74 | 76 | 91 | 2 | 64 | 31 | sw. | h. | 12 | 3 | 11 | 17 | ..... | 23 | 5 | ..... | ..... | ..... | ..... | 4 | 9 | 6.45 | L. Hughes. |
| Gibson | Trenton, 450 feet | 35 58 | 11 58 | 71 | 82 | 73 | 75 | 90 | 25 | 61 | 31 | sw. | h. 7. | 12 | 7 | 15 | 9 | ..... | 22 | 5 | ..... | ..... | ..... | 1 | 12 | 11 | ..... | A. S. Currey. |
| Gibson | Milan, 440 ft | 35 55 | 11 46 | 70 | 83 | 73 | 75 | 95 | 24 | 59 | 10 | s. | h. 8. | 12 | 13 | 6 | 12 | ..... | 23 | ..... | ..... | ..... | ..... | ..... | 10 | 11 | 5.56 | M. D. L. Jordan, M. D. |
| Giles | Pulaski | 35 15 | 10 00 | 75 | 85 | 85 | 82 | 92 | 23 | 65 | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9 | ..... | Prof. W. T. Mann. |
| Greene | Greeneville | 36 10 | 7 49 | 75 | 86 | 77 | 79 | 90 | 24 | 67 | 12 | sw. | h. | 24 | 16 | 7 | 8 | ..... | ..... | 3 | ..... | ..... | ..... | ..... | ..... | 6 | 2.30 | E. Link. |
| Hawkins | Rogersville | 36 22 | 5 57 | 70 | 82 | 70 | 74 | 89 | 23 | 63 | 10 | sw. | h. 6. | 15 | 10 | 10 | 11 | ..... | 29 | 1 | ..... | 1 | ..... | ..... | 3 | 12 | 3.15 | Thos. F. Walker. |
| Hardeman | Bolivar | 35 18 | 12 00 | 72 | 84 | 75 | 77 | 91 | 21 | 65 | 31 | s. | ..... | ..... | 20 | 6 | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 6.44 | E. P. McNeal. |
| Hardin | Savannah | 35 20 | 11 40 | 70 | 84 | 73 | 70 | 90 | 24 | 61 | 10 | w. | h. 6. | 12 | 19 | 6 | 6 | ..... | 19 | 2 | ..... | 1 | ..... | ..... | 2 | 5 | 4.31 | H. R. Hinkle. |
| Haywood | Brownsville | 35 36 | 12 20 | ..... | ..... | ..... | 79 | 99 | 22 | 61 | 10 | w. | ..... | ..... | 20 | ..... | 11 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 7 | 4.80 | Daniel Bond. |
| Henry | Paris | 30 33 | 11 25 | 74 | 83 | 74 | 77 | 90 | 7 | 65 | 30 | w. | h. | 13 | 7 | 9 | 15 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9 | 4.90 | J. J. Travis. |
| Humphreys | Waverly | 36 00 | 10 40 | 70 | 81 | 80 | 77 | 89 | 12 | 60 | 10 | sw. | h. | 24 | 5 | 11 | 15 | ..... | ..... | 2 | ..... | ..... | ..... | ..... | 2 | 8 | 5.08 | D. R. Owen. |
| Lincoln | Howell | 35 15 | 9 30 | 71 | 83 | 69 | 74 | 90 | 21 | 63 | 11 | s. | br. | 8 | 1 | 12 | 18 | ..... | ..... | 6 | ..... | ..... | ..... | ..... | ..... | 15 | 1.73 | O. R. Hatcher, M. D. |
| McNairy | McNairy Station | 35 00 | 12 00 | 75 | 85 | 73 | 78 | 93 | 23 | 65 | 19 | s. | h. | 24 | 15 | 11 | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8 | 4.25 | J. H. Blakely. |
| Montgomery | Sailor's Rest | 36 24 | 10 35 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | s. | ..... | ..... | 1 | 14 | 16 | ..... | ..... | 8 | ..... | ..... | ..... | ..... | ..... | 8 | 2.66 | John Minor. |
| Overton | Livingston, 966 ft | 36 23 | 8 17 | 73 | 81 | 70 | 75 | 88 | 23 | 61 | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8 | 3.63 | J. A. Laughlin. |
| Obion | Troy | 36 20 | 12 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | h. | 12 | 18 | 2 | 11 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8 | 5.70 | W. H. Caldwell. |
| Polk | Benton, 880 ft | 35 10 | 7 45 | 75 | 86 | 77 | 80 | 97 | 22 | 64 | 30 | sw. | h. | 7 | 9 | 10 | 10 | ..... | 8 | 2 | ..... | ..... | ..... | ..... | 11 | 8 | 1.83 | Joe Hood. |
| Rutherford | Murfreesboro' | 35 50 | 9 25 | 72 | 83 | 73 | 76 | 91 | 3 | 63 | 10 | sw. | br. | 7 | 1 | 4 | 10 | ..... | ..... | ..... | ..... | 1 | 1 | ..... | 9 | 11 | 2.84 | H. H. Clayton, (15d's) |
| Rutherford | Florence Station | 35 53 | 9 26 | 72 | 87 | 73 | 77 | 95 | 24 | 63 | 10 | nw. | br. | 12 | 13 | 11 | 7 | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | 9 | 2.58 | C. F. Vandeford. |
| Rhea | Grand View, 1,635 ft | 35 45 | 7 48 | 09 | 82 | 07 | 74 | 94 | 20 | 49 | 11 | sw. | h. 7. | 18 | 12 | 15 | 4 | ..... | 29 | 3 | ..... | 2 | ..... | ..... | 2 | 7 | 1.20 | Hattie R. Stratton. |
| Smith | Riddleton, 548 feet | 36 19 | 9 07 | 70 | 82 | 72 | 74 | 91 | 21 | 57 | 19 | sw. | h. | 16 | 2 | 15 | 14 | ..... | 25 | 11 | ..... | 4 | 2 | ..... | 3 | 11 | 3.65 | S. P. Fergusson. |
| Smith | Alexandria (near) | 35 30 | 8 56 | 77 | ..... | 74 | 75 | 91 | 22 | 65 | 30 | s. | l. | ..... | 2 | 18 | 11 | ..... | ..... | 2 | ..... | ..... | ..... | ..... | ..... | 12 | 4.59 | Irenus Beckwith. |
| Tipton | Covington | 35 20 | 12 38 | 72 | 86 | 72 | 77 | 93 | 21 | 61 | 10 | s. | br. 10. | 24 | 10 | 9 | 12 | ..... | ..... | 23 | ..... | ..... | ..... | ..... | 5 | 8 | 3.34 | T. W. Roane, M. D. |
| Williamson | Franklin | 35 50 | 9 48 | 70 | 82 | 73 | 75 | 89 | 3 | 68 | 30 | sw. | h. | 16 | 5 | 6 | 17 | ..... | 11 | 2 | ..... | ..... | ..... | ..... | 5 | 10 | 3.88 | Samuel Henderson. |
| Warren | McMinnville | 35 45 | 8 45 | 73 | 81 | 77 | 77 | 93 | 22 | 66 | 10 | n. | h. | 17 | 11 | 8 | 12 | ..... | ..... | 2 | ..... | 1 | ..... | ..... | 1 | 8 | 3.85 | R. M. Reams. |

**The "Iowa Weather Service," under direction of Dr. Gustavus Hinrichs, has forwarded the following advance proof of the July report of that service:**

The weather of July, 1883, was very favorable to the crops, being fair, nearly normal in temperature, with an excess of rainfall, and southerly winds prevailing.

The mean temperature of the air was but a little over one degree below normal; last year July was nearly five degrees below normal. The number of hot days has been high, especially during the first and last decade, while the middle decade was cool.

Insolation has been high, because, even during the stormy period, cloudy days were rare, and during the month clear days were numerous. The sun thermometer exceeded one hundred and forty degrees on twenty-one days; its highest reading was one hundred and sixty-one degrees on the 23d.

The total rainfall was below normal in southern central Iowa, from Union to Jasper counties; in the balance of the State it was considerably above normal, averaging about six inches in the northwest and in the southeast, and nine inches in the northeast. The highest rainfall, of fourteen inches, for the month, was measured at Decorah. The number of rain days averaged ten for the east and northwest, and about six for the balance of the State.

As usual during July, very heavy rains have occurred, but only in the north. The highest rainfall measured on one day was nearly six inches, at Homedale, south of Sibley, in Osceola county, on the 23d; next to this stands Algona, Kossouth county, with over five inches on the same date. But the most notable rain period of the month occurred in northeastern Iowa, from the 20th to the 23d inclusive, giving very nearly ten inches of rain in Howard and Winnesheik counties.

No tornadoes have occurred in Iowa, but several squalls have visited parts of Iowa; yet the most destructive of these storms have but touched Iowa. The squall of the 4th started about 5 p. m. in central Iowa, and reached southeastern Iowa about 9 p. m.; it was not very severe. The squall of the 12th started about 6 p. m. in Black Hawk county, reached the Mississippi in Scott and Clinton counties about 9 p. m., doing much damage by wind and hail; it continued to spread over central Illinois till about 11 p. m. About noon on the 13th another very severe squall started from southwestern Iowa, where considerable damage was done in Fremont and Page counties; the storm increased in fury while spreading over northwestern Missouri till abou-

3 p. m. Another storm of less severity visited northeastern Missouri and southern Illinois on the evening of the same day. A severe squall with hail reached, on the afternoon of the 18th, into northwestern Iowa, coming from Dakota. A southerly squall reached Polk and Jasper counties early on the 16th.

On the whole, the weather during July has been very fine; bright skies, aglow with ripening sunshine, alternated with enriching rains—summed up in splended crops of small grain and hay, and excellent pastures, and giving promise of a good crop of corn, for the fall season promises well also.

During the three last evenings of July the northern lights were seen, especially on the 29th.

At the end of May, this year's growing season, counted from April 1st, was sixty degrees in the aggregate ahead of last year's. We had gained nothing more at the end of June, for the last year's June was moderate, the same as this season's June. But during July we gained in the aggregate one hundred degrees over last year's July, so that on the first of August of this year we have received in the aggregate one hundred and sixty degrees of heat more than last year at this period. This fact, together with the fair sky and generally favorable distribution of rainfall, accounts for the greatly superior condition of our crops this year.

Note.—In the present press bulletin the storm record has been given in sufficient detail to help to dispel the exaggerated notions of danger from whirlwinds in Iowa. It will readily be seen that if squalls, extending simultaneously over a large storm front and progressing for hours like a huge wave, are heralded as "tornadoes" at every place they reach, people at a distance will soon wonder that towns exist at all in the northwest, and our own people will be scared into expensive tornado insurance. In time our buildings will be substantial enough to withstand our summer squalls and winter blizzards successfully. As to genuine tornadoes, they are rare and very limited in extent.

## The "Missouri Weather Service," has issued the following report for July, 1883:

The temperature during the past month has been considerably lower than the normal July temperature throughout the state. At the central station the mean temperature for the month was 77°.4, which is altogether out of tally with Dr. Engelmann's normal, being 1°.8 lower. There are only five instances since 1837 in which the mean temperature for July has gone below that of last month, at Saint Louis, *i. e.*, in 1839, '40, '48, '49, '63, and '65.

The lowest minimum temperatures were observed in the southwestern part of the state on the 9th and 10th, the lowest 52°, being observed at Greenfield on the 10th. At the central station, and indeed throughout the state, excepting the above, the lowest temperatures were observed on the 29th and 30th. The recorded minimum at the central station for the morning of the 30th was 59°.0, which is lower than any July minimum, excepting in the years 1870, '73, '75, '76, '77, and '82, during the past twenty-three years, at Saint Louis.

The highest temperatures, with but few exceptions,—they being in the southern part of the state—were observed on the 2d. The highest observed reading at the central station was 94°.8, which is lower than the general average maximum temperatures throughout the state. Higher temperatures were also observed nearly all over the state on the 10th, 11th, and 12th.

Throughout the region visited by the storm of the 13th a most remarkable change of temperature was experienced during or after the storm—remarkable on account of the quick change. At one place there was a range of 24°.0 in a half hour, at two others, a range of 28°.0 and 29°.0 in two hours.

The 13th was a day remarkable for the destructive wind storm which passed through the northwestern and northern portions of the state. It originated in the northwest, coming through eastern Nebraska and southern Iowa, in the earlier part of the day. At 12.40 it struck Corning in the extreme northwestern part of the state, and following down the Missouri river valley, Glasgow at about 3 p. m., and Saint Louis at near 6 p. m. The damage done to grain crops and orchards was very great and irreparable. There was also much damage done to buildings of all kinds in unroofing, and in some localities completely wrecking them. The following named places in Missouri suffered most: Stansbury, Burlington Junction, Trenton, Bethany, Linneus, Albany, Jefferson City, Wellsville, Ashburn, Malden, and Saint Louis. There were but few lives lost, two being reported in this state. Near Browning, this state, the C. B. & K. C. passenger train was blown from the track and twenty people injured. In some localities its effects much resembled those of a tornado, but generally it was a remarkably steady, straight blow for upwards of half an hour. The storm was preceded the night before by very brilliant lightning which was visible almost all over the state.

The rainfall has been heaviest in the southwestern part of the state. At the central station it was about the normal amount for July, a little above, taking the mean of the three Saint Louis stations. The storm of the 13th was generally accompanied by but a light rainfall.

In some instances, as at Miami, Pleasant Hill, Shelbina, Louisiana, ten miles north of Mexico and Macon City, hail accompanied the storm of the 13th, at some places it being reported as large as ordinary hens' eggs. Hail was also reported at Lexington on the 19th.

At Cairo, Illinois, a light earthquake shock was felt at 11.15 a. m., on the 6th, and at 1.30 a. m. on the 14th.

## The following is a summary of meteorological observations made at the Washburn College, Topeka, Kansas, by Professor J. T. Lovewell, director of the "Kansas Weather Service":

| Tri-daily observations. | June 20th to 30th. | July 1st to 10th. | July 10th to 20th. | Mean. |
|---|---|---|---|---|
| *Temperature of the air* | | | | |
| 7 a. m. | 67.6 | 73.8 | 74.2 | 71.9 |
| 2 p. m. | 85.9 | 72.4 | 88.4 | 83.9 |
| 9 p. m. | 73.0 | 72.4 | 73.4 | 72.9 |
| Mean | 75.5 | 74.3 | 77.3 | 76.2 |
| *Relative humidity. (in per cent.)* | | | | |
| 7 a. m. | 92 | 92 | 90 | 91 |
| 2 p. m. | 76 | 77 | 72 | 75 |
| 9 p. m. | 90 | 90 | 87 | 89 |
| Mean | 83 | 86 | 83 | 85 |
| *Pressure, as observed.* | | | | |
| 7 a. m. | 29.15 | 29.47 | 28.96 | 29.19 |
| 2 p. m. | 29.02 | 29.06 | 28.92 | 29.00 |
| 9 p. m. | 29.06 | 29.06 | 28.91 | 29.01 |
| Mean | 29.07 | 29.19 | 28.93 | 29.03 |
| *Miles per hour of wind.* | | | | |
| 7 a. m. | 8.6 | 11.5 | 6.5 | 8.9 |
| 2 p. m. | 12.1 | 17.1 | 4.1 | 11.9 |
| 9 p. m. | 7.0 | 10.7 | 3.8 | 7.2 |
| Total miles | 2,103 | 2,829 | 2,863 | 7,795 |
| *Clouding, (by tenths.)* | | | | |
| 7 a. m. | 2.8 | 3.0 | 6.5 | 3.8 |
| 2 p. m. | 5.2 | 5.1 | 4.1 | 4.8 |
| 9 p. m. | 1.8 | 3.0 | 3.8 | 2.8 |
| *Rain.* | | | | |
| Inches. | 2.15 | 3.07 | .58 | 5.80 |

The period embraced in this report has been rather above average temperature for this season, and we can again record quite a heavy rainfall.

On fifteen days the temperature has reached 90° and upward, the highest being 98°, on June 30th. The lowest temperature was 62°, on June 23d. Highest barometer, July 18th, 29.300, reduced to sea-level and zero, 30.235. Lowest barometer, July 12th, 28.780, reduced, 29, 708.

On June 23d, Just after a heavy rain storm, the air having had a temperature of 65° to 70° all the forenoon, the temperature suddenly rose more than 20° in consequence of a hot current of air from the south. This lasted but half an hour, when the temperature fell as suddenly as it had risen.

On the evenings of the 7th and 8th of July auroras were visible at this station about 9 o'clock in the evening. The wind-travel has been less than any previous month this year, and no very high gales have occurred here. The prevailing wind has been from the south, as usual at this season.

## The following extract is reprinted from the report of the Ohio Meteorological Bureau for the month of July, 1883:

The mean height of the barometer, 30,025 inches, was higher than that of either of the three months preceding.

The range of the barometer was the smallest yet recorded in the reports of this bureau. The maximum height was but 30,315 inches, and the minimum height 29.642 inches, making a range of but .673 inch.

The mean temperature, 72°.1, was the highest monthly mean temperature since the observations were commenced by the bureau, but was more than two degrees below the normal mean temperature for July. The highest temperature, 97°.8, which is so far the maximum for the year, was reported from Lima, Allen county, on the 3d.

The lowest temperature reached was but 43°, and was reported from Granville, Licking county. The range of temperature was the smallest so far recorded, being 54°.8.

The amount of precipitation was greater than that of November, December, January, March, or April, but not so great as that of February, May, or June. It was, however, .45 inch greater than the normal rainfall for July.

The greatest depth of rain fell at Quaker City, Guernsey county, being 7.23 inches. The least, 1.55, was at Lebanon.

The mean number of days on which rain fell was 11.2. The rains were nearly all accompanied by thunder and lightning.

Aurora was observed on the last three days of the month.

The following is the rainfall, in inches, at five rain-gauge stations, established by Mr. Mikesell in Fulton county:

Wauseon, 6.44; Franklin township, 4.90; Chesterfield township, 5.24; Pike township, 4.63; Swan Creek township, 4.30.

Number of days on which rain fell at one station, 6; two stations, 3; three stations, 1; four stations, 4; all stations, 5; total, 19.

The railway weather signals were continued during July, and by examination of the reports it is found that eighty-six per cent. of the predictions were verified.

## The following extract is taken from the "Monthly Weather Review" of the Dominion of Canada:

NOTES ON THE STORM IN WESTERN ONTARIO ON THE NIGHT 10TH JULY.

The remarkably heavy rainfall which accompanied the thunder storm of

the night of the 10th July, causing such lamentable loss of life and damage to property in the neighborhood of London, made it desirable that a special investigation into the meteorological conditions which prevailed generally throughout the country prior to, during, and after the storm, should be undertaken.

Special reports were accordingly obtained from upwards of one hundred of our correspondents in Ontario, which made it possible to map with a fair approximation to accuracy the areas affected by the storm and the amount of rainfall.

Before commencing the work of mapping the rainfall, the conditions of pressure, humidity and temperature, which had prevailed were closely investigated, using not only the reports from the regular telegraphic stations, but some others received by mail. These additional stations only bring out slight irregularities in the isobars, and such undulations in the isobaric curves as generally accompany showers and thunder storms in the summer season; there was, moreover, nothing in either of the synchronous maps investigated, which in the present state of knowledge of the sequence of meteorological phenomena, would have justified a prediction that an unusual amount of rain would fall that night in western Ontario, nor indeed anything beyond what was predicted, viz: "local showers," such as actually occurred in other parts of Ontario. An investigation of the reports from upwards of a hundred stations brings out the fact, that the belt in which the greatest precipitation occurred, lies in a direction about northwest and southeast, covering an area of nearly twenty miles wide by fifty miles in length, and the path of the storm as described by several observers agrees with this.

Some correspondents state that the storm seemed to turn and come back on them, which would be perfectly true in appearance even if not in fact, for examination of the photographic records of barometric pressure during several thunder storms, shows that each thunder storm is in itself a miniature cyclone; that it, so far as barometric pressure is concerned, generally consists of a comparatively slow fall of barometer; then a sudden or sharp rise of greater or less extent, followed again by a fall and again by a sharp rise; thus showing a series of waves of pressure passing over the country. To an observer it might appear, as the wind changed on the approach of a second depression, that the storm which had passed was returning, when in reality it was the surface wind blowing in towards the approaching depression. At the same time under certain circumstances, a thunder storm might circle round and return to the same spot; this, however, happens but rarely, the general course being as described above, that what may seem to an observer to be the same storm is really only a change of wind to meet a fresh eddy. During the late storm in London it seems to have been a very marked characteristic that there was but little wind, and this is what might have been anticipated, from the fact that those observers who watched their barometers closely state that the fluctuations were very small, in fact hardly appreciable.

This storm will be memorable from the exceptionally heavy rainfall which accompanied it, but apart from this it had no special feature to distinguish it from any ordinary summer storm. The devastation at London appears to have been caused by the exceptional rainfall taking place over both branches of the Thames at the same time; and as the two branches meet as it were, *almost end on* the river flowing away nearly at right angles to the branches, it seems a matter within the province of hydraulic engineers to decide whether even a much less rain than that which fell on the night of the 10th, might not cause damage to the suburb of Kensington, and further whether one branch should not be diverted so that the junction of the rivers might form an acute angle.

There seems to be a tendency to an increase in the number of these heavy storms, and as the country is now so much cleared up, the water passes more quickly into the streams, whereby a lighter rainfall would now produce as danerous a freshet as would formerly have been caused by a much heavier rainfall.

*Summary of meteorological observations for the month of July, 1883, made to the Illinois Department of Agriculture, Springfield, August 1, 1883. Hours for taking observations: 7 a. m., 2 p. m., 9 p. m.*

| Stations. | | Elevation above sea—feet. | Thermometer. | | | | | | Barometer. | | | | | | Wind. | | Rain. | | No. of days on which cloudiness averaged 0.8 or more. | Mean humidity. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| County. | Post office. | | Highest. | Lowest. | Mean. | Range of. | Highest daily mean. | Lowest daily mean. | Highest. | Lowest. | Mean. | Range of. | Highest daily mean. | Lowest daily mean. | Prevailing direction. | Max. velocity or force in miles per hour. | No. of days on which rain or snow fell. | Total rainfall. | | |
| *Northern div'n.* | | | ° | ° | ° | ° | ° | ° | | | | | | | | | | | | |
| Cook | Chicago | 657 | 91.00 | 50.90 | 71.00 | 40.10 | 82.90 | 55.60 | 30.253 | 29.641 | 29.972 | 0.612 | 30.242 | 29.671 | sw. | 4 | 12 | 5.43 | ..... | 69.3 |
| Kane | Aurora | 676 | 91.00 | 47.00 | 73.28 | 50.00 | 83.00 | 61.33 | 30.220 | 29.630 | 29.950 | 0.590 | 30.200 | 29.650 | sw. | 5 | 10 | 3.07 | 5 | 78.0 |
| Lee | Prairieville | 725 | 94.00 | 56.00 | 72.00 | 38.00 | 84.00 | 65.00 | 30.250 | 29.600 | 29.922 | 0.650 | 30.210 | 29.630 | s. | 3 | 10 | 5.00 | 6 | 76.1 |
| Warren | Monmouth | 700 | 97.00 | 57.00 | 76.29 | 40.00 | 87.00 | 64.00 | 29.780 | 29.180 | 29.493 | 0.600 | 29.760 | 29.230 | nw. | 6 | 13 | 5.66 | 10 | ..... |
| Peoria | Peoria | 460 | 98.00 | 52.00 | 70.90 | 46.00 | 86.75 | 66.78 | 29.944 | 29.306 | 29.630 | 0.638 | 29.899 | 29.364 | s. | 6 | 8 | 3.57 | ..... | 70.0 |
| McHenry | Marengo | 925 | 93.00 | 47.00 | 69.50 | 46.00 | 80.20 | 58.20 | ..... | ..... | ..... | ..... | ..... | ..... | sw. | 6 | 7 | 2.94 | 5 | ..... |
| Whiteside | Morrison | 970 | 95.00 | 50.00 | 72.75 | 45.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | sw. | 6 | 10 | 5.17 | 2 | ..... |
| De Kalb | Sycamore | 800 | 92.00 | 54.40 | 70.06 | 37.60 | 80.80 | 58.25 | ..... | ..... | ..... | ..... | ..... | ..... | sw. | 3 | 7 | 5.50 | 7 | ..... |
| Ogle | Polo | ..... | 93.00 | 47.00 | 70.30 | 46.00 | 80.25 | 58.00 | ..... | ..... | ..... | ..... | ..... | ..... | sw. | ..... | 9 | 5.02 | ..... | ..... |
| Stark | Elmira | ..... | 90.00 | 55.00 | 71.22 | 41.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 4.19 | ..... | ..... |
| *Central division.* | | | | | | | | | | | | | | | | | | | | |
| Sangamon | Springfield | 640 | 95.00 | 54.00 | 74.90 | 41.00 | 83.70 | 64.20 | 30.339 | 29.690 | 30.010 | 0.649 | 30.275 | 29.720 | s. | 5 | 12 | 3.77 | ..... | 68.9 |
| Pike | Griggsville | 625 | 95.00 | 58.00 | 75.30 | 37.00 | 90.00 | 63.00 | 30.350 | 29.660 | 30.010 | 0.690 | 30.250 | 29.750 | sw. | 6 | 9 | 2.77 | 5 | ..... |
| McLean | Normal | ..... | 99.00 | 59.00 | 75.26 | 40.00 | 87.00 | 67.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Coles | Mattoon | 724 | 96.00 | 59.00 | 75.00 | 37.00 | 84.00 | 65.00 | ..... | ..... | ..... | ..... | ..... | ..... | sw. | ..... | 9 | 4.64 | ..... | ..... |
| Christian | Pana | 760 | 93.00 | 62.00 | 77.91 | 31.00 | 84.00 | 68.50 | ..... | ..... | ..... | ..... | ..... | ..... | s., sw. | 8 | 8 | 5.75 | 10 | ..... |
| *Southern div'n.* | | | | | | | | | | | | | | | | | | | | |
| Alexander | Cairo | 377 | 92.00 | 60.00 | 77.70 | 32.00 | 84.50 | 63.90 | 30.367 | 29.749 | 30.412 | 0.618 | 30.310 | 29.814 | sw. | 6 | 14 | 7.95 | ..... | 73.8 |
| Union | Anna | 625 | 93.00 | 57.00 | 76.21 | 36.00 | ..... | ..... | 30.360 | 29.770 | 30.070 | 0.590 | ..... | ..... | s., sw. | 4 | 7 | 2.86 | 3 | ..... |
| Crawford | Palestine | ..... | 99.00 | 62.00 | 75.09 | 37.00 | 84.87 | 65.50 | ..... | ..... | ..... | ..... | ..... | ..... | sw. | 3 | 6 | 8.30 | 2 | ..... |
| Saint Clair | Mascoutah | ..... | 96.00 | 60.00 | 78.00 | 36.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 5.60 | ..... | ..... |
| Marion | Centralia | 492 | 96.00 | 58.00 | 77.00 | 38.00 | 85.66 | 64.66 | ..... | ..... | ..... | ..... | ..... | ..... | sw. | 5 | 9 | 6.95 | 12 | ..... |
| Hamilton | McLeansboro' | ..... | 94.00 | 58.00 | 77.20 | 36.00 | 84.70 | 66.70 | ..... | ..... | ..... | ..... | ..... | ..... | sw. | 6 | 9 | 3.44 | 3 | ..... |
| Bond | Greenville | ..... | 99.50 | 61.00 | 78.96 | 38.50 | 86.60 | 66.60 | ..... | ..... | ..... | ..... | ..... | ..... | s. | ..... | 6 | 7.50 | 5 | ..... |
| Perry | Swanwick | ..... | 92.00 | 59.00 | 74.40 | 33.00 | 82.00 | 63.70 | ..... | ..... | ..... | ..... | ..... | ..... | s. | 5 | 8 | 5.24 | 4 | ..... |
| Pope | Golconda | ..... | 92.00 | 65.00 | 76.62 | 27.00 | 83.50 | 66.25 | ..... | ..... | ..... | ..... | ..... | ..... | nw. | 5 | 11 | 4.13 | 4 | ..... |

Chart I. Tracks of Low-barometer Areas, July, 1883.

# Chart I. Tracks of Low-Barometer Areas. July, 1883.

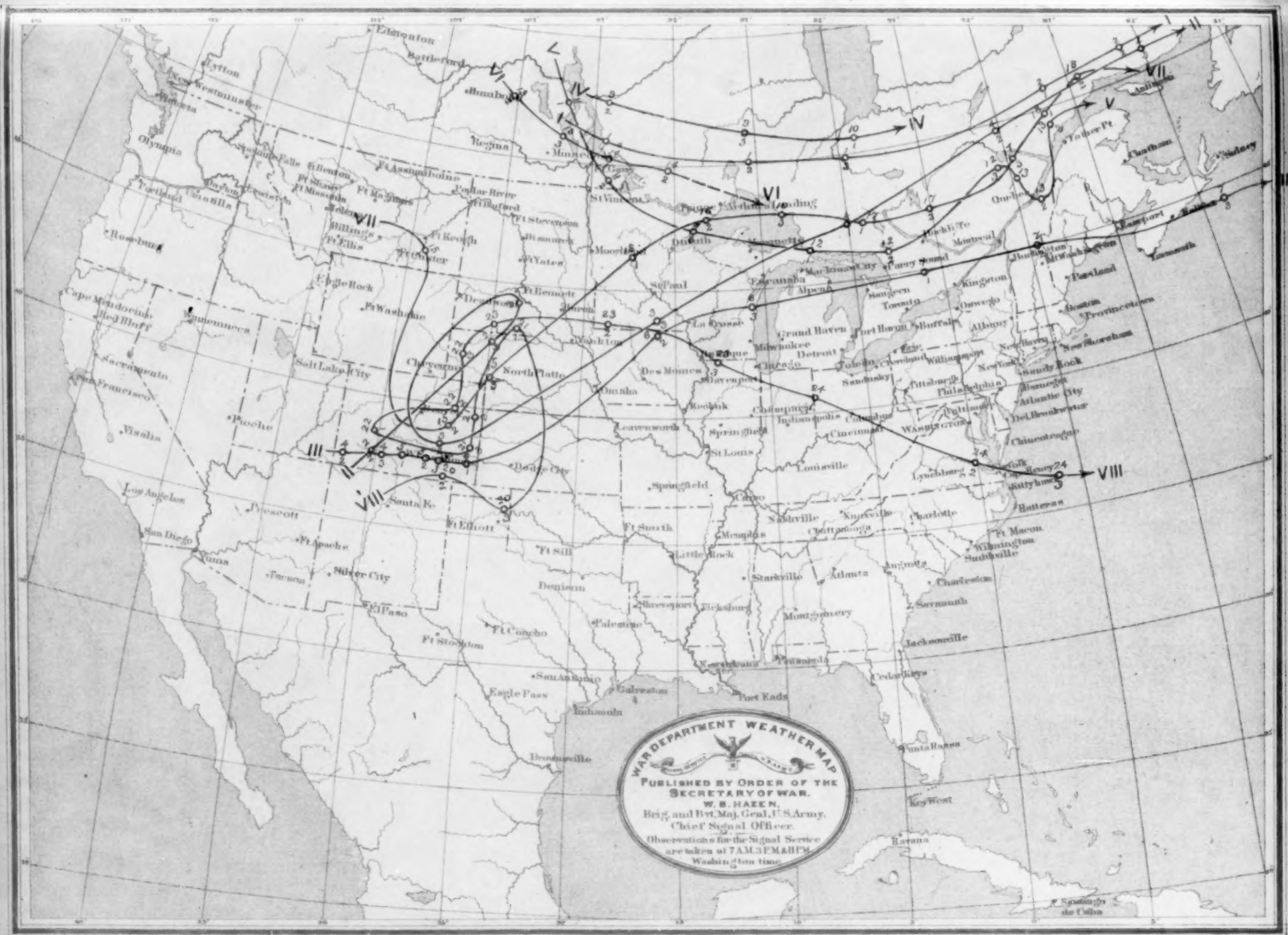

Chart II. Ocean Storm Tracks, July, 1883.

# Chart II. Ocean Storm Tracks, July, 1833.

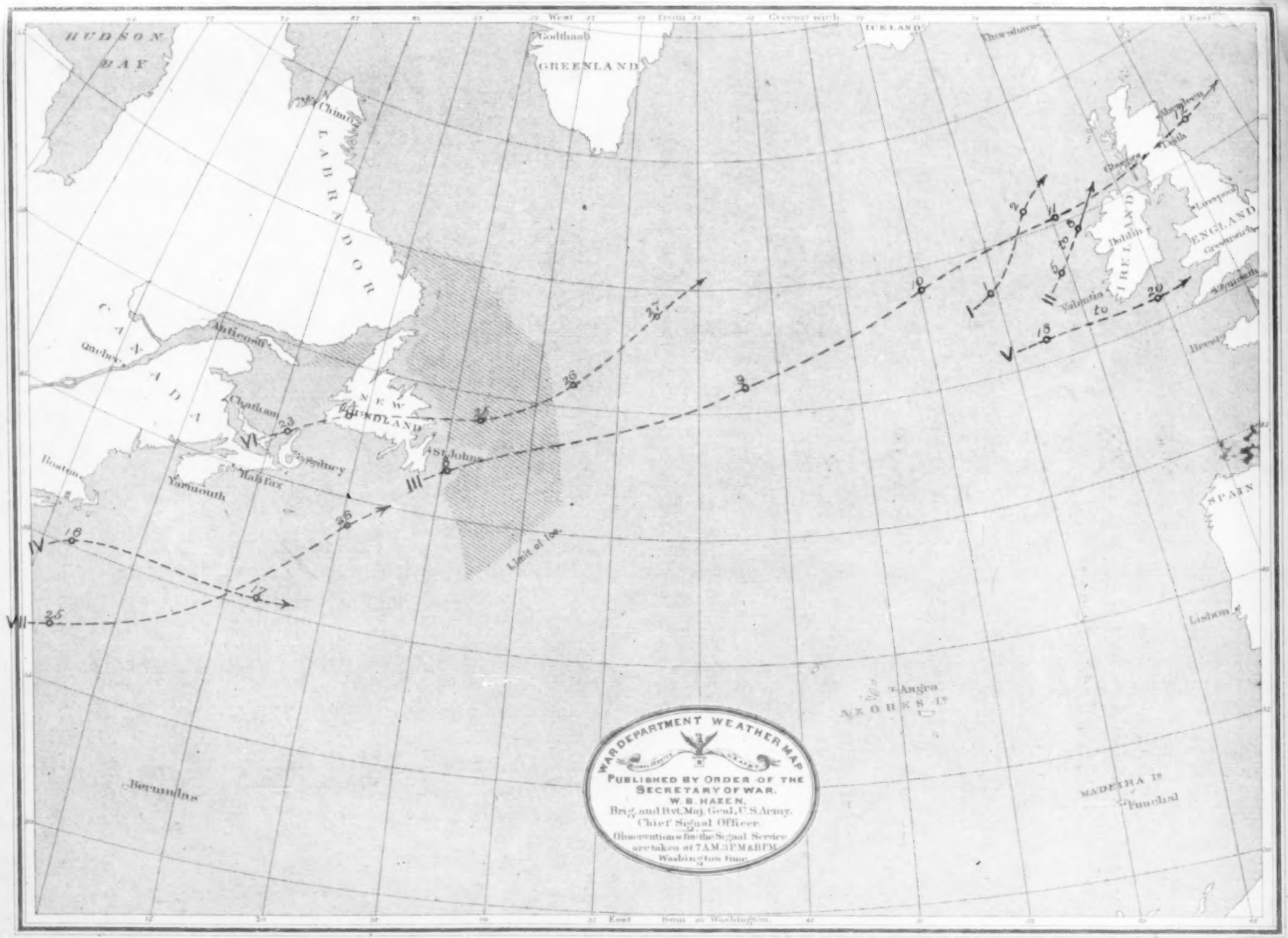

Chart III. Isobars, Isotherms, and Winds, July, 1883.

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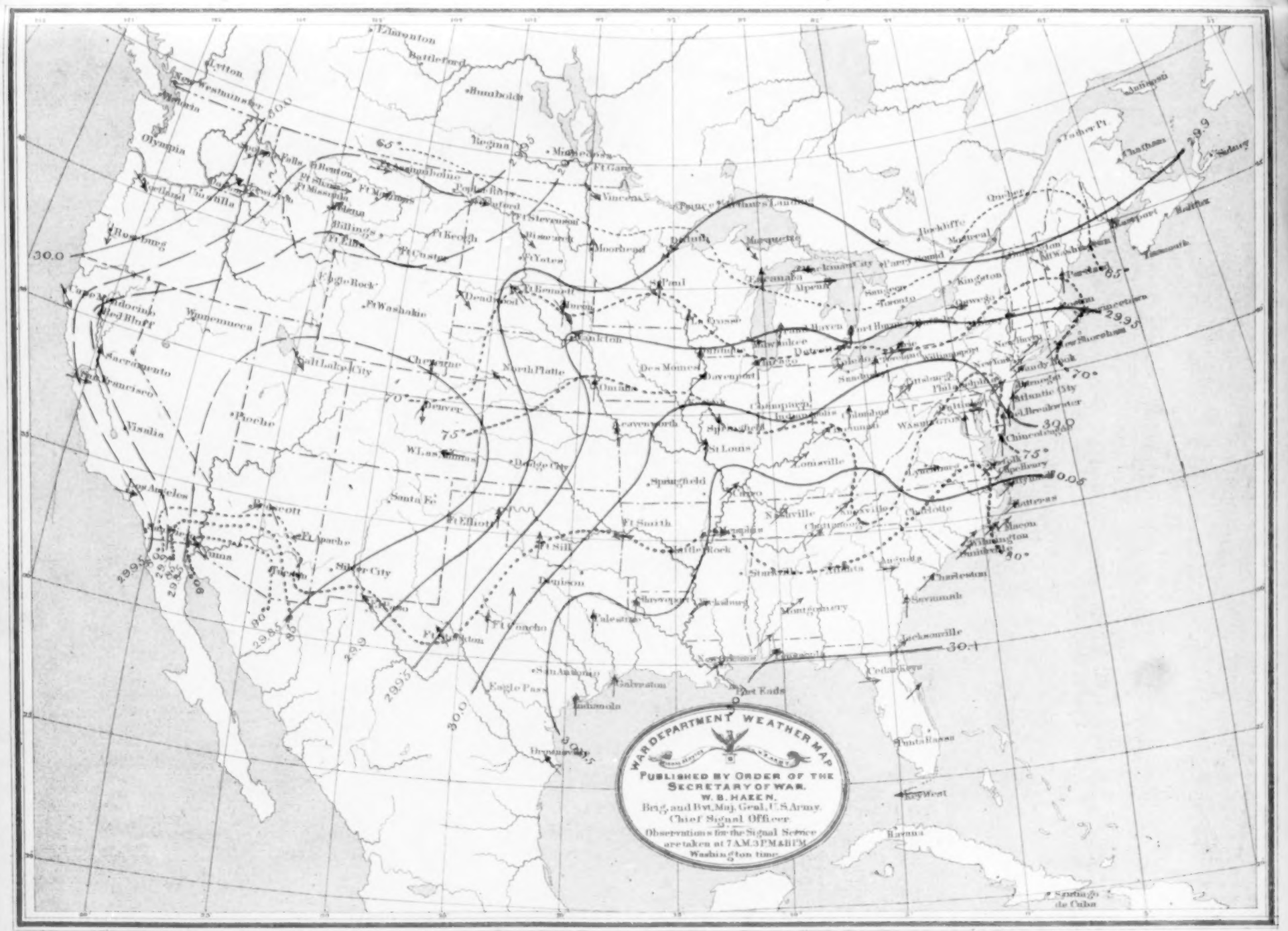
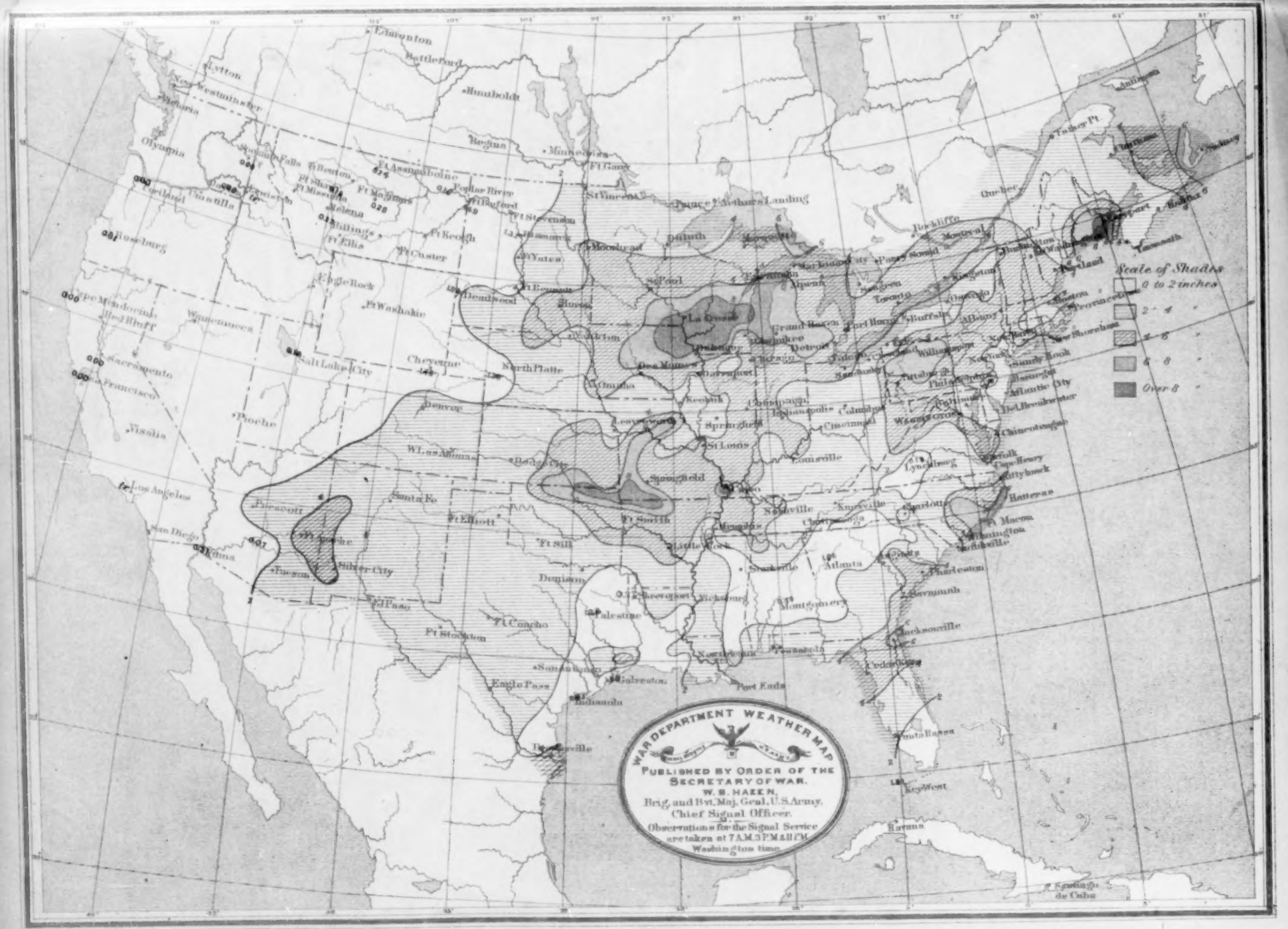

WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
W. B. HAZEN,
Brig. and Bvt. Maj. Genl. U.S. Army,
Chief Signal Officer.
Observations for the Signal Service are taken at 7 A.M. 3 P.M. & 11 P.M. Washington time.

Chart IV. Precipitation, July, 1883.


Scale of Shades
0 to 2 inches
2 - 4 "
4 - 6 "
6 - 8 "
Over 8 "
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